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OBSTETRIC OPERATIONS
HE PATHOLOGY OF THE PUERPERIUM

BEING VOLUME FOUR OF

A PRACTICAL TREATISE ON
OBSTETRICS

BY

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ANSLATED UNDER THE SUPERVISION OF, AND WITH NOTES AND ADDITIONS

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PART VII.

Obstetric Operations.

CHAPTER I.

VERSION.

VERSION is an operation which changes one presenting fetal part for another. There are two varieties, according as it is the head or the breech which is brought to the pelvic brim: Cephalic version, Podalic or pelvic version. Each one of these methods may be practised by either external or internal manœuvres; but, although cephalic version is usually performed by external manipulation, podalic version, on the other hand, almost exclusively calls for internal manipulations. Latterly, both internal and external manipulations have been conjoined, under the names of *combined* or *mixed* version, or *bi-polar* of Braxton Hicks.

To-day the advantages of pure external version are so generally recognized, especially for cephalic version, that it has become the routine method. By means of it we are able to remedy vicious presentations of the fœtus, such as those of the shoulder, and it thus renders unnecessary resort to operations as dangerous, almost, for the mother as for the child.

VERSION BY EXTERNAL MANIPULATIONS.

Struck by the infinitely better prognosis both for the mother and the child offered by vertex presentations, naturally the earlier obstetricians aimed at substituting the vertex for every other presentation. This practice, indeed, is found to have been prevalent amongst the very earliest races, and the Mexicans and the Japanese resorted to more or less crude methods to cause the fœtus to present in normal fashion. Thus, amongst the Mexicans, the woman, from the beginning of the seventh month, was subjected to massage in order to force on the fœtus presentation by the vertex, and if this did not suffice, she was seized by the feet, held head downward, and shaken until the desired end was attained. In Japan, a special family constitute the accoucheurs, and their method of action is the following: "If the vertex does not present, the woman loosens her clothing, and, lying on her back, the physician massages downward from the thorax towards the epigastric regions. If the fœtus is on the right side, the physician places his knees against the woman's left side, and with his hands pulls the fœtus over. If fæcal masses obstruct on the right side, these are pushed down by the physician's left hand, whilst his right shoves the fœtus where it belongs. No force is ever used in these manœuvres. During labor, if the arm or the elbow presents, this is pushed back into the uterus, and held there by the right hand externally, whilst the left hand seizes the fœtus through the abdominal walls, and it is turned from right to left till the vertex presents." (Kangawa.)

Hippocrates advised succussion; the Arabian physicians and Rhazes advised transferring all presentations into that of the vertex, the latter even going so far as to counsel amputation of the presenting part in order to gain space for the vertex.

Roesslein (1513) and Rueff (1554) counselled cephalic version even in case of breech presentation; but at this date, Ambroise Parè (1550) and his pupil Guillemeau, advise podalic version by internal manipulation, and under the influence of Mauriceau (1668) and of Lamotte (1721) cephalic version nearly disappeared from French practice. In 1690 Siegmundin again advocated cephalic version by internal manipulations. Again neglected for a while, it reappeared in 1750, through the influence of Smellie, who soon gave it up, and then it was advocated by Aitken in 1784, who advised an attempt at cephalic version always before recourse to podalic. It was not, however, until Wigand's time (1817) that cephalic version was carefully described, and its indications laid down.

In Germany, external version was practised from the time of the appearance of Wigand's monograph, by d'Outrepont (1812), Siebold (1821), Busch (1826), Michaelis (1833 to 1838), Kilian (1834), Lumpe (1843), Martin (1849), Naegelé and Grenser (1854), Scanzoni (1855), Crede (1853), C. Braun (1859), Spaeth (1857), Hegar (1869), and above all, by Schroeder (1874 to 1876), Esterle (1878), and Spiegelberg (1878–1880).

In England, external version was not recognized by Ashwell (1828), Blundell (1830), Ramsbotham (1844); and although Rigby (1841) and Churchill (1842) were familiar with Wigand's monograph, they did not appreciate all the advantages to be derived from this operation. It is only since the appearance of the works of Barnes, Duncan, and Playfair, that it has become classic.

In America the same holds true, and it is only of late years that external version has acquired place amongst the obstetrical operations.

In France, in 1845, Hubert de Louvain demonstrated the advantages of external version, but it is only latterly that Tarnier and his pupils, Chantreuil, Pinard, and Budin, have made the method a familiar one to all.

"External version," says Pinard, "ought to be practised in pregnancy in every case where, after the eighth month, the vertex lies in one of the iliac fossæ, or in the upper uterine segment." For our part, we do not agree entirely with our colleague in regard to external version, for we make an exception in case of breech presentations.

Basing his deductions on the figures given by Hegar and Hecker in regard to the mortality in pelvic presentations, Pinard, in accord with Maffei, Hegar, Chantreuil, and Budin, forcibly insists on external version in case of pelvic presentations, and declares that : "1. In breech presentations, cephalic version is possible; 2. It is dangerous neither for mother, nor for child." If these two propositions are perfectly true, they are still open to certain objections, one of which has already been mentioned by Pinard himself: "The breech may recur again after a number of versions." It is true that this may be prevented by the application of a binder, but we have seen that certain women will not tolerate the binder. If, however, we grant this objection, there is another, which we believe to be grave, and it is the following: Pelvic presentations are especially serious in primiparæ, for in them the resistance offered by the cervix and the soft parts is much greater than in multiparæ. In the latter, pelvic presentations are not very grave, and for our part we have always seen such presentations, whether complete or incomplete, terminate happily in them. If there is an instance where external version ought to be practised by preference, in pelvic presentations, it is in primiparæ. Now, amongst the contra-indications to cephalic version, Pinard cites presentations of the breech in the primipara. Whence the dilemma, either version is useful in case of primiparæ, and therefore why in such instance is it contra-indicated? or it is useless and impossible, and why then attempt it? Why, above all, reserve version for multiparæ, where labor is easy, and entails danger neither for the mother nor for the child? If it be true that cephalic version by external manipulation is without risk for either mother or child, it is also, we think, useless in multiparæ, often impracticable in primiparæ, that is to say, just where it is really useful. Therefore do we reject it in both cases, and here we are in agreement with Pajot and with Depaul.

The first, the great indication for external version, and for us it is absolute, is *presentation of the trunk*. Herein all authorities agree. When, during pregnancy, the position is transverse, we must perform cephalic version, and endeavor by every means in our power to maintain the new position.

The second indication is, for us, pelvic deformity, and herein we accord fully with Tarnier and his pupils, but we hasten to add where pregnancy has reached term. Pelvic presentations, it has been seen, are more favorable before term, (Milne, Goodell, Budin), and therefore podalic version is indicated; but, at term, vertex presentations are more favorable, and, therefore, cephalic version should have the preference.

The third indication is *abnormal insertion of the placenta,* all the more so since abnormal presentations are usually associated.

According to Pinard, external version is contra-indicated: 1. In certain pelvic presentations, in primiparæ especially; 2. In multiple pregnancy; 3. In certain cases of shoulder presentation, where there exists uterine deformity; 4. During labor.

Here, again, we differ from our colleague. In regard to his third contra-indication, we believe it theoretical rather than practical, for it is difficult, if not impossible, to recognize, during pregnancy, the uterine deformity to which he has reference, (median partition), and in the presence of a transverse presentation we believe in always attempting external version.

In multiple pregnancy, it is only after the birth of the first fœtus that external version is possible, and then it is very easy.

The contra-indication as to labor seems to us too absolute. Wigand states as conditions where it is possible: The waters have not entirely escaped, or but a little while; the uterine pains are neither irregular nor spasmodic. Hubert says that external version may succeed during labor, at times even after the waters have entirely escaped. We believe that version by external manipulations should be attempted in transverse presentations, even at the beginning of labor. It is difficult; it will often fail; but the fear lest thereby we cause prolapse of the cord or of a limb, or produce a face presentation, does not appear to us well founded. Even where it fails, we may still resort either to the bi-polar method or else at the right time to podalic version.

The conditions necessary for success in external version are: 1. The diagnosis of abnormal presentation must be precise; 2. The uterus must not be too irritable; 3. The fœtus must be moveable enough to allow of change of position without injury to the uterus. The membranes must be intact, or at least there must remain in the uterus considerable liquor amnii; 4. Version once performed, the vertex must be maintained in its position. (See Transverse Presentations, Vol. I.)

External Version before Labor.—Operative Method.—The oldest and simplest method, but so useless that it has long been renounced, was to cause the woman to lie on her side, to the right if the head was deviated to that side, and *vice versâ*, a pillow under the abdomen, and to leave her in this position until the vertex had lodged at the superior strait. In transverse presentations this method always fails, and to-day all authorities resort to the following manœuvre, as described in Pinard's work: "Before operating, the woman should be made to assume the dorsal position, the legs extended, and slightly separated. If, during the manipulations, the uterus should contract, we must stop, and await relaxation.

1. "*The head is in one of the iliac fossæ, and the breech is in the opposite flank.*—One hand is to be applied to the vertex, the other to the breech, and by slow, sustained pressure exercised in opposite directions on the fœtal poles, bring them into the median line."

Nivert, on the contrary, counsels that pressure be alone made on the cephalic end, for the reason that pressure applied to both poles in opposite directions simply amounts to nothing. We cannot agree in this, but believe with Pinard that pressure on the breech is much more efficacious than that on the vertex, since it is more readily transmitted to the vertebral column; and further, where the infant is large, or the uterine axis transverse or oblique, exclusive pressure on the head amounts to nothing.

2. "*The head is in the upper segment of the uterus, the breech below.*—We must first mobilize the fœtus, by either pressing down the head laterally, or by lifting up the breech on a finger in the vagina, and pressing down the head in the opposite direction; the two poles being now accessible, slow and sustained pressure must be made so as to make the head ascend, and the breech descend by the shortest route. The pressure on the breech has always seemed more effective than that on the head."

External Version during Labor.—E. Martin manipulates as follows: "The woman lies on her back, the pelvis slightly elevated, the operator sitting by preference with his back to the woman's face. One hand is applied over the inferior portion of the abdomen so as to push towards the superior strait the fœtal pole nearest it, whilst the other hand is applied above, and pushes towards the fundus the higher fœtal pole. These manœuvres are applied only between the pains. During a pain, the object is simply to retain the ground gained. After an interval the manœuvres are repeated. If the hands tire the nurse may be entrusted with the uterus during a pain. At times it is advantageous to make the woman lie on that side towards which the inferior extremity is deviated, usually the head, and pressure is applied to it either by the hand or by a cushion. Once the head engaged, the woman should retain her position, or else the membranes may be ruptured, and the fœtal part thus fixed."

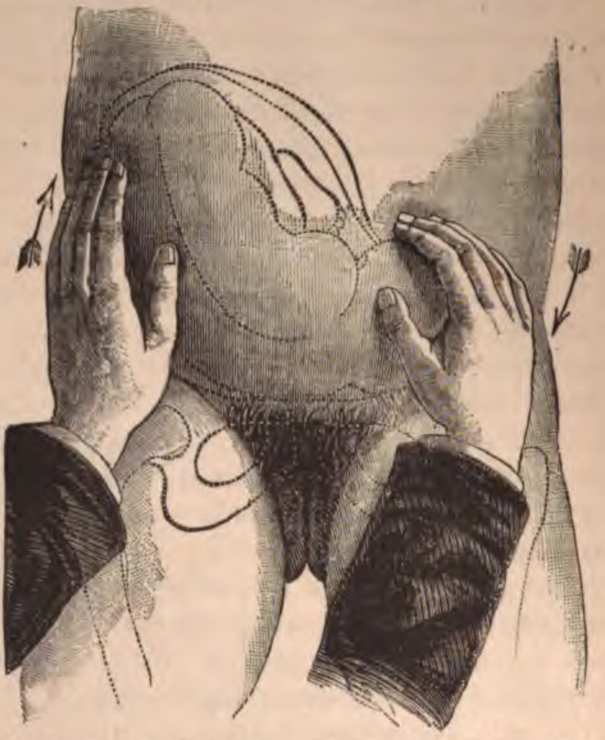


FIG. 1.—EXTERNAL CEPHALIC VERSION. TRANSVERSE PRESENTATION. (*Pinard.*)

According to Playfair, "external version should never be resorted to, except where the abnormal presentation has been recognized before labor, or at least before rupture of the membranes. It is only applicable to transverse presentations, for we must not expect to obtain complete evolution of the fœtus, but only a substitution of the head for the lower extremity." It is thus seen that we are in complete accord with the opinion of the English accoucheur.

Combined External and Internal Version.—Bi-polar Version.—

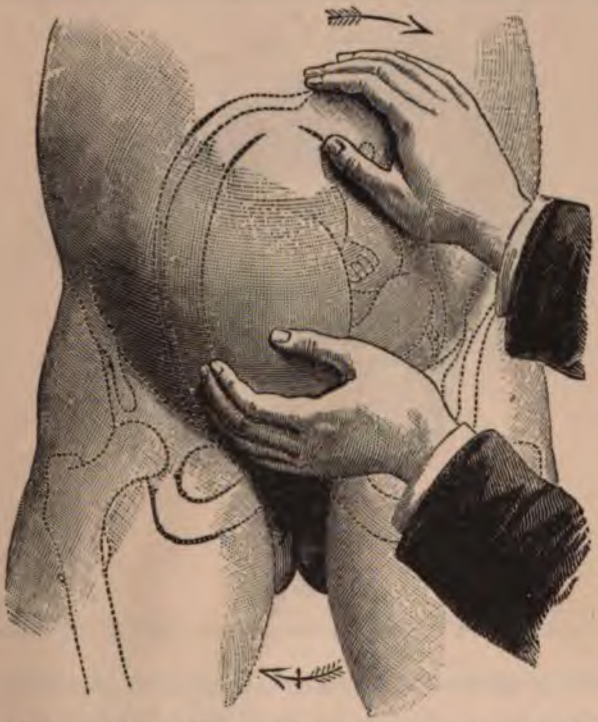


FIG. 2.—CEPHALIC EXTERNAL VERSION. PRESENTATION OF THE BREECH (*Pinard.*)

This consists in acting with one hand externally on one fœtal pole, while the finger in the vagina acts on the other. In the hands of d'Outrepont, Esterle, Rigby, Simpson, Robert Lee, it was a method applicable to cephalic version, and Hohl, according to Naegelé and Grenser, practised it as follows: "The parturient lies horizontally, until the head has engaged. When the uterus is inclined to one side, the woman reclines on the opposed side. The uterus is steadied by an assistant, whose hands are applied flat against the lateral superior sides of the uterus. At the moment when, by manipulation, the head is brought towards the superior strait, the assistant gently pushes the uterus towards the same side, for example, to the left, when the head is deviated to the left. Then we place the left hand above the horizontal rami of the pubes on the side of the head, while the index and the middle finger of the right hand, in the vagina, rest on the fœtal shoulder. These fingers gently lift the body and push it towards the mother's right, during the intervals of a pain if the membranes are intact, constantly if they have ruptured, while with the left hand the head is pushed towards the superior strait. The head once engaged, we rupture the membranes, but only when the liquor amnii is abundant."

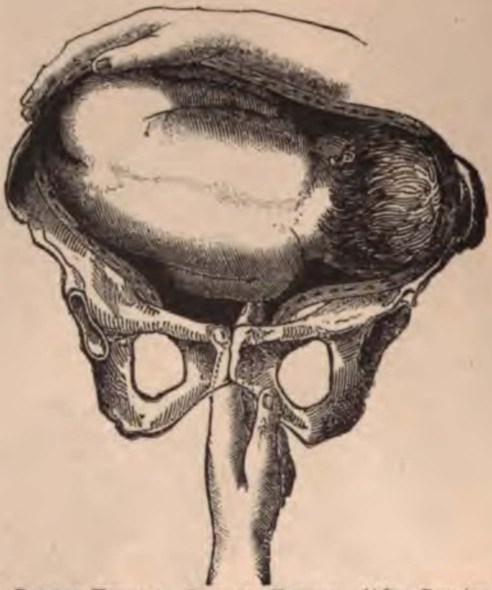


FIG. 3.—BIPOLAR VERSION. CEPHALIC VERSION. (After *Braxton-Hicks.*)

Braxton-Hicks applies these manœuvres to every variety of version, both cephalic and podalic, whatever the presentation, and this not only when the presenting part is above the brim, but also after the waters have escaped, even though the fœtus is deep in the cavity, and the cord or an arm have prolapsed. (Figs. 3 and 4.)

He thus describes his method: "Introduce the left hand into the vagina, place the right hand on the abdomen, in order to recognize the position of the fœtus, and the direction of the head and the feet. If, for example, the shoulder presents, it should be pushed by one or two fingers in the direction of the feet; at the same time pressure is exercised with the other hand on the pelvic extremity of the child. (Fig. 3.)

"This pressure will bring the head towards the orifice. It is received on the ends of the internal fingers, and it may be placed in any desired position. If the breech do not rise easily towards the fundus, after the head has been applied over the brim, the hand should be withdrawn from the vagina, and applied to the breech to cause it to rise. The head should be steadied gently for a while, until the pains have fixed the child in its new position, and until the uterine walls have accommodated themselves to the new form. If the membranes are intact, it is useful to rupture them as soon as the head is over the internal os. The head will then retain its position."

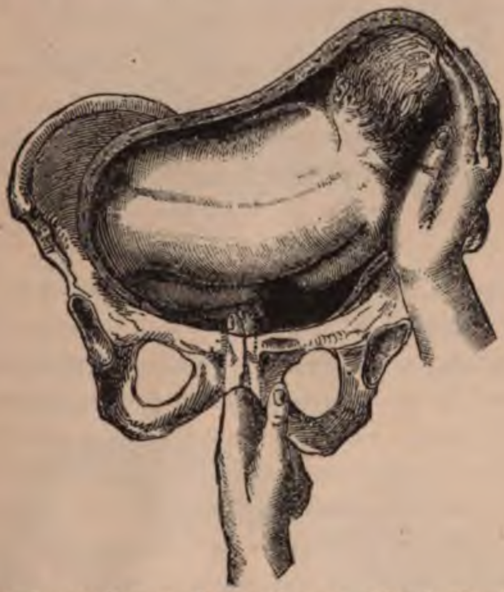


FIG. 4.—BIPOLAR VERSION. PODALIC VERSION. (After *Braxton-Hicks.*)

This method, which requires a certain degree of cervical dilatation and consecutive rupture of the membranes, is applicable only to the beginning of labor; for we doubt its success when the waters have escaped, the uterine contractions are energetic, and the uterus has contracted down on the fœtus.

To resume then: Perform cephalic version at the end of pregnancy, and at the beginning of labor, in every case of transverse presentation; at the end of pregnancy retain the head in its position by means of Pinard's binder, whenever it is borne; if not, await the onset of labor, do cephalic version, and rupture the membranes to fix the head; such is our advice. Abstain from cephalic version in case of presentation of the pelvic extremity, for it is often impossible in primiparæ, and it is useless in multiparæ. Nevertheless, since it is not injurious, the accoucheurs who try it are not to blame.

VERSION BY INTERNAL MANIPULATIONS.

This may be either cephalic or podalic. The first, practised almost exclusively by the ancients, has to-day been rejected, and the latter substituted to such a degree that, when the word *version* is used unqualified, it refers to podalic version by internal manipulations.

Internal Cephalic Version.

Up to the times of Ambroise Paré and of his pupil Guillemeau, this form was alone practised, although hardly with success, since in 1122 we find Albucasis saying, with resignation worthy of a Mahommedan, "Version will succeed in case it please God." It was Siegmundin, Busch, d'Outrepont, and others, who first laid down exact rules for its performance. The method recommended was (Busch) to rupture the membranes with the right hand where the head was to the left, and *vice versâ*, and, seizing the head by the neck, to bring it to the superior strait. Two fingers steadied the head, and with the other hand the uterus was massaged to excite it to contract, and the fingers in the vagina were only withdrawn when the head was firmly engaged.

D'Outrepont, and others, advised action on the trunk by means of the hand in the vagina, while the external hand endeavored to depress the head towards the superior strait. Here is seen the germ of Braxton-Hicks' method. Hohl and Wright counselled placing the right hand, where the head was to the left, on the head, the left hand in the vagina, and its fingers in the axilla. These fingers lift the body and press it towards the maternal right side, while the right hand pushes the head towards the superior strait, an assistant, at the same time, pushing the fundus uteri to the left. (Fig. 6.)

Rigby (1844), Simpson (1845), Robert Lee, Braxton-Hicks, thus used both hands; but, as has been pointed out by Barnes, it is the external hand which does most of the work, and to-day, therefore, cephalic version is performed by pure external manipulations at the end of pregnancy, and at the beginning of labor.

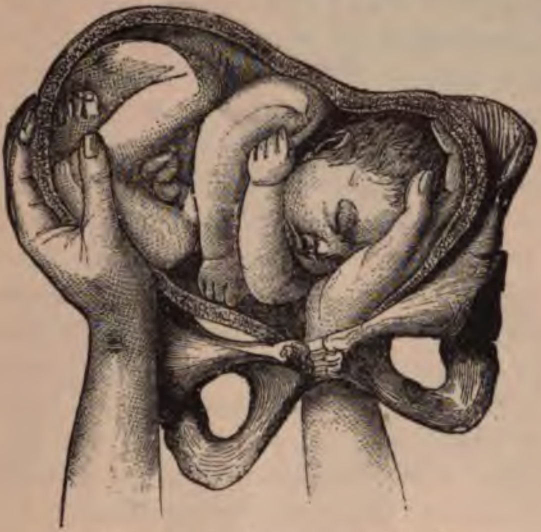


FIG. 5.—CEPHALIC VERSION. (After *Busch.*)

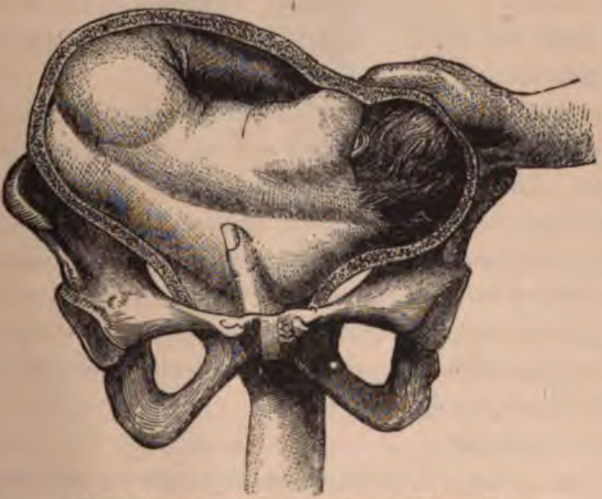


FIG. 6—CEPHALIC VERSION. After *D'Outrepont.*)

During labor, indeed, internal cephalic version has been justly abandoned. Usually it is impossible, or, if possible, podalic version is more so, and should be chosen, since then we may end labor at will; the risk to the child will not be greater, and podalic version is always quicker than cephalic.

Podalic Version.

It is in the works of Celsus that we find the first rules applicable to this form of version—applicable, however, only when the fœtus is dead. Although Villanova, (1312), Benivieni, (1502), and Rösslein, (1513), knew this method, it is not till the times of Ambroise Paré, 1560, that we find a description of this method of version and extraction. In 1561, Franco reproduced the text of Paré's work, and in 1609, Guillemeau modified somewhat the operative method. From the time of Mauriceau (1668), Lamotte (1721), Puzos (1753), podalic version replaced cephalic version. In 1685, Portal performed version by one foot, and Puzos and Deleurye made clear the advantages of using a single foot. The latter, also, carefully differentiated version from extraction, and Denman (1788), and Boer (1791), insisted on this point. Finally, Osiander, Levret, Smellie, Stein, carefully studied the indications and operative technique, and Osiander showed that version may succeed, at times even when the head has already engaged, and this too, as he says, *non vi sed arte.*

Podalic version is then an operation which consists in bringing to the superior strait the pelvic extremity of the fœtus, no matter what the previous presentation.

It is indicated whenever normal labor is impossible on account of abnormal presentation of the fœtus, and where cephalic version is impracticable. The indications, then, are:

1. Transverse presentations during labor.

2. Every complication which endangers the life of the mother and of the child, and which calls, consequently, for rapid termination of the labor. Such, for instance, are hemorrhage, eclampsia, rupture of the uterus, certain face presentations, prolapse of the cord, certain monstrosities, pelvic tumors causing dystocia, etc.

3. Pelvic deformity.

a. The indication is absolute in case of transverse presentations which could not be remedied before labor, or which were not recognized, after the seventh month. Up to six months, the fœtus is small enough to allow us to count on spontaneous evolution. Before resorting to podalic version, the diagnosis must be exact, that is to say, we must know not only that the shoulder presents, but which shoulder, and consequently, the location of the head, and the ventral surface of the fœtus.

b. Here version only aims at rescuing the mother and the infant from threatened danger, and not alone to modify the fœtal presentation. In many instances, then, the forceps will answer, and the accoucheur must decide as to which method of interference will answer the best for the individual case.

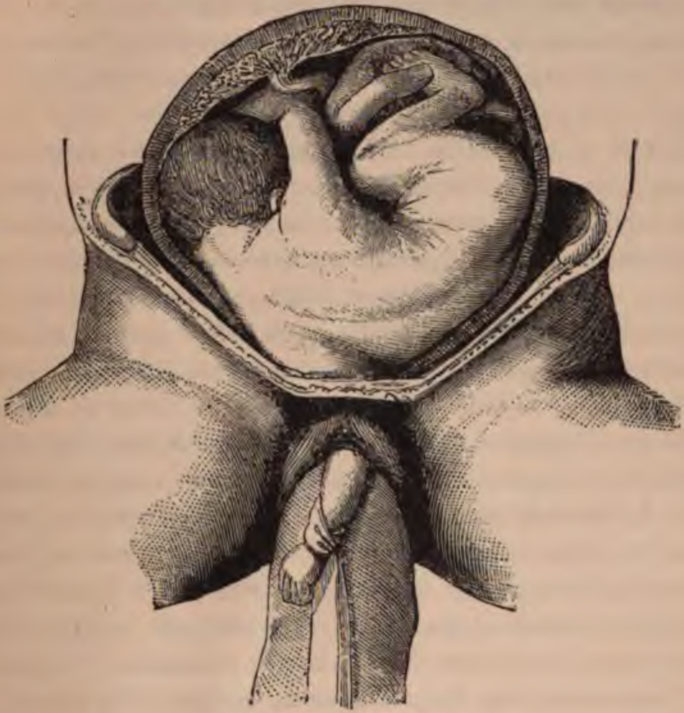


FIG. 7.—PODALIC VERSION.

c. We have already spoken at length of version in case of contracted pelvis. Although authorities here differ on certain points, they all agree in favor of version in case of oblique contraction, since then the accoucheur may direct the fœtal part towards the greater pelvic space.

Finally, we must not forget that extraction is not necessarily the immediate consequence of version, and that, in many instances, the change of fœtal position having been obtained, it is possible, advantageous at times, to leave the case to Nature.

Conditions necessary for the successful Performance of Version.—Certain ones are absolutely indispensable, and others only favorable.

The indispensable conditions are: 1. The dilatation, or at least complete dilatability of the cervix. 2. Fœtal part not firmly engaged. 3. Pelvis not too contracted. 4. Uterus not too contracted.

A favorable condition, if not absolutely indispensable, is the integrity of the membranes, or at least the presence of enough liquor amnii to allow of fœtal motion, and thus prevent too great contraction of the uterus.

1. *Dilated or Dilatable Os.*—By complete dilatation is understood that condition where the walls merge with those of the vagina, so that the uterine, cervical, and vaginal canals are one; by dilatibility is understood such softness that the cervix may readily be converted into the state of dilatation. We are thus opposed to Schroeder, who claims that it is not absolutely indispensable that dilatation should be such as to allow the introduction of the hand, and that version is most likely to succeed when attempted early. Podalic version, through an undilated os, is very difficult and very dangerous, for it is like *accouchement forcé*, and, therefore, except under stringent necessity, it should never be resorted to unless the cervix is dilated or dilatable. Otherwise we may lacerate the cervix and do injury of serious import to the woman. When version is attempted prematurely, there are two accidents likely to occur: Extension of the arms, and contraction of the cervix around the neck. If this first complication is readily overcome, it is not so with the second. The extended head is imprisoned, the fœtus dies of asphyxia, or if we make violent traction this may result in detaching the head from the body, and leaving it in the uterus.

There is a time of *election* for version, and this when the cervix is dilated or dilatable, and the membranes are intact. If now the membranes are ruptured, and the hand passed at once to the fundus, so as to lose as little of the liquor amnii as possible, the feet may be seized with great ease, and version, except in case of pelvic deformity, may be performed with ease and rapidity.

2. Version consists in evolution of the fœtus. If, now, the fœtus is deeply engaged, or immobilized, the passage of the hand, in the first place, is difficult, if not impossible, and, again, it will be necessary to push up the fœtal part, and this may be impossible, and effort result in

rupture of the uterus. We run the risk then both of killing the mother and the infant.

3. We must never forget that although the flat hand may pass through a contracted pelvis, this hand must come out holding the fœtal foot, and, therefore, no longer flat but closed—that is to say, it must make its exit increased in volume by the fœtal part, as well as by the fact that it is doubled on itself. We must never then attempt version in a pelvis contracted below 2.7 inches.

4. The uterus must not only allow the introduction of the hand, but it must also be yielding enough to permit fœtal evolution, and to allow retractility without danger of rupture. Sometimes the uterus is irritable, and then, if we wait a little, it will be possible to do version with ease. All depends on the necessity of rapid delivery, which, if it does not exist, may render embryotomy out of the question.

There are, above all, two causes of exaggerated uterine contractions: Total escape, and for long, of the liquor amnii; premature administration of ergot.

1. The most favorable, if not indispensable condition for version, is the *integrity of the membranes.* This condition, however, is rarely fulfilled, for the presentation being above the brim, premature rupture often occurs, and the waters flow off readily, the uterus contracting on the fœtus the less the amount of liquor amnii present. Enough water, then, must at least remain in the uterus to prevent such contraction, and to allow fœtal evolution. Unfortunately, it must be said, premature escape of the waters is often the result of error on the part of the physician, oftener still of the midwife. The membranes are ruptured before the assurance has been gained, by palpation, of the presentation, in the hope that the fœtal part will engage. The rule should be to wait for complete dilatation before rupturing the membranes. Once the time of election at hand, rupture, and at once insert the hand into the uterus, thus effectively tamponing the cervix and preventing entire escape of the waters. In case the head presents, if in the interests of the mother and the infant it is necessary to end labor, push this up, search for a foot, turn and deliver, or else have recourse to the forceps.

2. We have already stated that we are absolutely opposed to the administration of ergot as long as there is anything in the uterus. Particularly does this apply to cases of abnormal presentation. Unfortunately

the error is often committed of administering ergot in these cases, and it is then that we see supervene those tetanic contractions, which are but too often followed by spontaneous rupture of the uterus, a rupture all the more certain if we attempt version. Here version is contra-indicated, and embryotomy must be resorted to, and this is also indicated by the fact that the fœtus is usually dead.

Preliminary Precautions.—Before practising version, there are a number of precautions to be taken, certain of which are indispensable to success. We must above all be sure of our diagnosis. If the head presents, make out whether it be vertex or face, to what point of the pelvis the occiput or the chin points—in other words, not only diagnosticate the presentation, but the position, in order to know where the feet are. If the body presents, recognize by which shoulder; sometimes such exact diagnosis is not possible, until the hand is in the uterus. Further, any instruments which might be required, such as the filet, laryngeal tube, scissors, etc., should be at hand. The bed should have considerable elevation, and be resisting, for, since it is necessary for the hand to pass to the fundus, the operator will have to depress the arm greatly. It is often necessary to place a board under the mattress in order that the woman's nates may not sink too much. Usually, the woman is placed in the dorsal position, the nates at the very edge of the bed, the feet resting on a couple of chairs, and the limbs separated. An assistant should hold each leg, flexing the thigh on the trunk. If necessary a pillow or cushion may be placed under the nates, to elevate them.

In certain instances, where the feet are in front, or difficult to reach, the woman may be placed, for the time being, in the lateral position. The knee-chest position, advocated by certain gentlemen, appears to us objectionable, because it is our habit to anæsthetize during version.

If version is practised at the time of election, and in a woman with large pelvis, chloroform may be dispensed with. Otherwise it is absolutely indicated. The anæsthesia should be complete, surgical, administered by a competent assistant, and should continue during the entire period of the operation. Thus is obtained absolute passivity on the part of the woman, and the operator may act more quickly, aside from the fact that the woman is spared pain.

The bladder and rectum should be emptied, in particular the former by the catheter.

As for the choice of hand to operate with, authorities are not in accord. The general rule is to take that hand which, placed between pronation and supination, corresponds by its palmar surface to the ventral surface of the fœtus. In vertex presentations, for instance, in the left occipital the left hand, in the right occipital the right hand—that is to say, left hand if the feet are to the right, and *vice versâ*.

This is the custom in Germany. In England, where version is performed with the woman lying on the left side, the left hand is always used. For our part, we consider the choice of hand a matter of secondary importance. For if version is easy, one hand will answer as well as the other, and if it is difficult, there is one circumstance which forces us to deviate from theoretical rules. When the liquor amnii has escaped for some time, the inserted hand awakens contraction of the uterus, and the hand is squeezed so that it is deprived of sensation, and we must, of necessity, insert the other hand instead. I have often been obliged to make this substitution a number of times. The best we can do to save the hand is to straighten it out during the contraction, and wait for relaxation before continuing the operation.

It goes without saying that the coat should be removed and the shirt sleeves rolled up. The nails should be cut short, on a level with the pulp of the fingers, and the arm should be well greased, never, however, greasing the hand which is to seize the foot.

Having made the above preparations, we proceed to the *operative method*.

This, according to most authorities, is composed of three stages:

1. Introduction of the hand and search for the foot.
2. Evolution of the fœtus.
3. Extraction of the fœtus. This latter stage does not in reality belong to version, because, once the fœtus turned, version is completed, and we may often leave the rest to Nature. Thus, most German writers describe version under breech presentations. But since immediate extraction after version is the rule, we will follow the example of French writers, and describe extraction in this place.

1. *Introduction of the Hand and search for the Feet.*—The hand should ever be introduced during the interval in the pains. The fingers should be brought together in the shape of a cone, the thumb against them, and penetrate slowly, rotate as it were, into the vagina, the dorsal surface be-

ing turned towards the sacrum when the bottom of the vagina has been reached. At the same time, it is absolutely requisite to control the uterus with the other hand, or by the hands of an assistant, in order that as the fingers enter the uterus the vaginal attachments may not be dragged upon or torn, and again in order that the uterus may be depressed as much as possible nearer the internal hand. Another important point is that the hand be made to traverse the vagina in the axis of its curvature, and in order to do this, as the hand penetrates it is necessary to depress the elbow. The hand once at the cervix, which we suppose to be widely dilated, the membranes are either ruptured or intact.

If ruptured, we must immediately enter the uterus as deeply as possible, even to the fundus, if necessary. The feet, indeed, are usually higher up than is supposed, and many inexperienced operators fail in version because they do not dare pass the hand deep enough. When the hand has reached the fundus, only the thickness of the walls separates it from the external hand. We must, hence, manipulate carefully, and with extreme gentleness.

If the membranes are intact, they must be ruptured. Here opinions vary. Peu, Smellie, Deleurye, Boer, and latterly, Hüter and Naegelé and Grenser, advise introducing the hand between the uterine walls and the membranes, until the feet are reached, and only then to rupture. Hüter has even been able to perform version without rupturing the membranes. For our part we are opposed to this, and we believe the membranes should always be ruptured over the cervix, always, however, at once introducing the hand, and thus tamponing with the wrist, to prevent escape of the liquor amnii. Our reasons for this opinion are: 1. While the hand is passing between the uterine walls and the membranes, these often rupture over the cervix, and version is rendered difficult from the fact that the ruptured membranes are applied closely against the fœtus. 2. If we seize the foot through the membranes, we may pull on the membranes as well as on the foot, and thus cause partial detachment of the placenta. 3. In passing between the uterus and the membranes we may detach the placenta, in case of lateral insertion. 4. Searching for the feet through the membranes necessitates more exact knowledge of their position than we are often able to obtain. 5. As for the possibility of turning without rupturing the membranes, this necessitates very tough membranes, and a very acquiescent uterus; and further, as Schroeder points out, the foot slips in the membranes and is difficult to seize.

Wherefore, again, we recommend rupture of the membranes at the level of the cervix. Three methods of searching for the feet are in vogue.

The first, derived from Madame Lachapelle, consists in going directly to them, seizing them, and bringing them down. This constitutes *hasty* version, and requires very exact diagnosis, and while excellent in such an event, in case of error it exposes us to trouble.

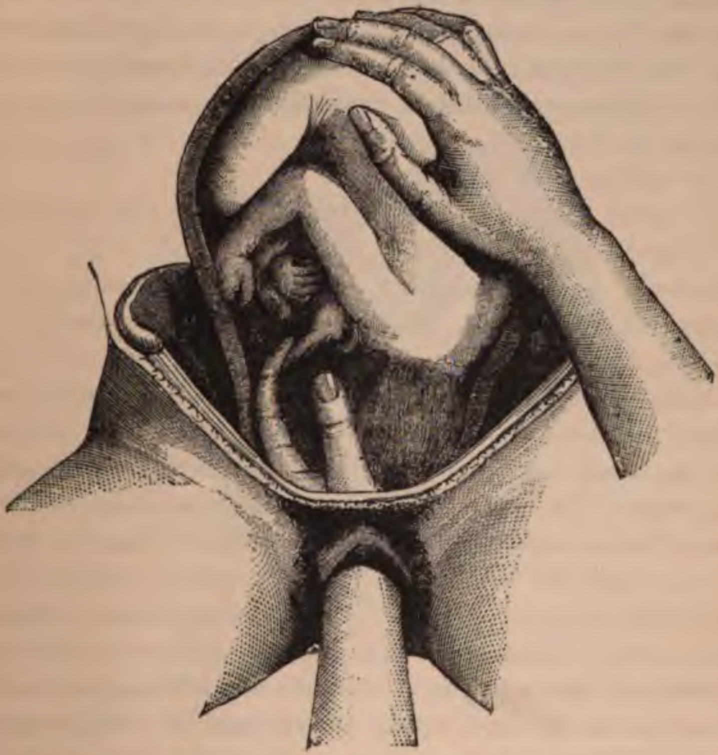


FIG. 8.—PODALIC VERSION. (1st stage.) Introduction of hand to seize the feet.

The second, advocated by Dubois, consists in passing behind the fœtus, lifting it up, following the posterior wall of the uterus up to the fundus. The hand is then turned so that its dorsal surface lies against the anterior wall of the uterus, and the feet are at once found by the concavity of the hand. This is an excellent method, true enough, when the ventral surface of the fœtus is posterior, and the feet there as well. But if the feet are in front, they cannot thus be found.

The third is the classic method. The road is longer, but more certain.

The hand in the cavity seeks the lateral or posterior surface of the fœtus. Following this surface to the nates, and thence along the thighs, and thence along the leg, it surely finds the feet. Bailly advises following the anterior surface of the fœtus, but in order that this method may succeed, there must exist considerable liquor amnii, the fœtus be fairly moveable, the uterus not irritable, and often these conditions are not present. This proposition of Bailly's then is impracticable.

Each one of these methods possesses advantages, but requires special conditions. The best plan is to follow the advice of Lachapelle, having made as precise a diagnosis as possible beforehand. If necessary, we can grope our way to the feet, until we seize a foot or a knee, or even hook the finger, as we will see, in the groin.

Seizure of the Feet.—Must we seize both feet, or one, or, in the latter event, which?

Whenever it is possible to grasp both, this is advantageous, but this only happens in easy version. Barnes prefers the knee to the foot, and insists upon this. Portal first proved that we might turn by one foot. Puzos insisted on but one foot, and this is the practice of almost every accoucheur in France, in England, in Germany. Version thus performed is, they say, easier, quicker, less painful for the mother, less dangerous for the child. "In case of incomplete presentation of the feet," says Schröder, "we are better able to leave the termination of labor to Nature, than where both the feet present. The first part of delivery is, true enough, a little slower and more difficult, but the after-coming head passes the more readily, because of the dilatation of the soft parts by the breech and one thigh. In the interest of the child the inferior portion of the body need not be delivered rapidly, but the superior portion ought to pass quickly."

Which foot ought we to grasp? Authorities differ. The greater number are in favor of the nearest, or lowest foot. (Kilian, Lumpe, Scanzoni, Martin, Lange, Depaul, Bailly, etc.) It is not only easier to grasp, but it further appears anterior at the moment of extraction, that is to say behind the symphysis. This is our practice, and that of Tarnier. Others, on the contrary, advise grasping the superior foot. (Roederer, Joerg, Hohl, Simpson, Kristeller.) Barnes says that thus evolution is more complete, while Scharlau and Haselberg point out that by pulling on the superior foot it may lock with the inferior, and thus render version impracticable.

For our part, whether one or another foot is seized matters little in general. Only when the back is posterior may it be advantageous to grasp the superior foot. As Pajot says, with truth: The best foot is that which is grasped the best.

To distinguish the superior from the inferior foot, we must remember the position of the fœtus, and follow the border of the foot. In case of the superior foot, the internal border faces below, and in case of the inferior foot, it faces above.

If we cannot reach the foot, we must grasp the knee. This is particularly practised and recommended by Simpson, Barnes and Simon Thomas de Leyde. According to the latter, version by the knee offers the following advantages: "1. Whenever the uterus is not too much contracted, whatever the presentation, we reach the knee more readily than the foot. 2. Often we know more certainly, beforehand, the position of the knee. 3. In podalic version the force which changes the presentation acts with greater advantage on the knee, and further we may use more force on it, without endangering the fœtus, in case of difficult version." Barnes adds that the knee is nearer than the foot, and while the latter must be seized by the full hand, the finger bent on itself is enough to pull down the former.

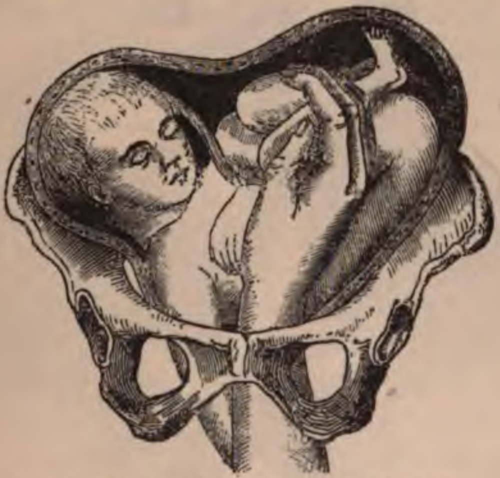


FIG. 9.—GRASP OF THE UPPER (SUPERIOR) FOOT.

When the inferior extremities are too far from the superior strait, Deutsch advises the following procedure: 1. Make the fœtus undergo a movement of rotation around its longitudinal axis. 2. Disengage the feet. "As for the choice of hand, this is according to rule. If we are dealing with a shoulder presentation, for example, the dorsal surface of the fœtus being posterior, the palmar surface of the hand is applied to the thorax or the shoulder of the fœtus, and by pressure from in front back, and from below above, the fœtus is turned on its longitudinal axis

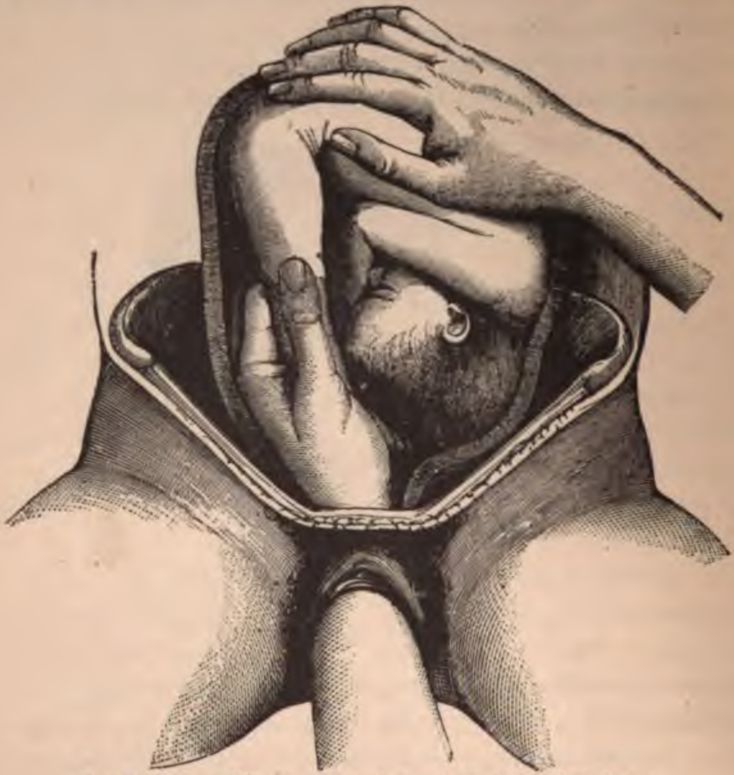


FIG. 10.—PODALIC VERSION. (Second stage.) Evolution of the fœtus.

so that its anterior surface looks downward, and the thorax is elevated. Often many attempts are necessary for the success of this manœuvre. The fœtus is held in this position by the thumb, and the four other fingers are turned downwards, and passed along the back to the nates, the legs are pushed towards the sacro-iliac synchondrosis, and the feet fall of themselves into the hand of the operator." (Naegelé and Grenser.) According to Deutsch, by this method the uterus is less irritated, version is easier, and the danger of fracturing the limbs is slight. The method does not seem to us practicable, except in the presence of much liquor amnii, a small fœtus, and a non-irritable uterus, and here the usual method will succeed as well.

Finally Gueniot advises, in difficult cases, a method already used by Cazeaux, and which he calls the ano-pelvic.

"1. The weight of the body is to be used to penetrate to the fundus. 2. To take as the fulcrum of the tractions on the fœtus, the pubic arch, or the sacro-coccygeal joint, by means of the curved finger in the rectum. 3. Thence to proceed as in ordinary version." The advantages of this method are: 1. The fœtal pelvis is usually easier to find than the feet. 2. The fulcrum chosen is most solid, and does not yield. 3. Traction being direct, no force is wasted. 4. Whatever the direction of the traction, the evolution of the fœtus may be affected. 5. When podalic version has failed, the ano-pelvic method may still be resorted to with success.

2. *Evolution of the Fœtus.*—This consists in making the fœtus turn on itself, so as to convert the existing presentation into the pelvic. In order that the fœtus may turn, it must not be fixed in the uterus. We must hence act between the uterine contractions.

Wigand has described two methods of action: "The foot seized, traction is made during the pains, taking the precaution to bend the child along its anterior surface, flexion thus being easier and more complete. Formerly this was called the *great turn.* Usually, however, we make traction by flexing the fœtus, first anteriorly, and then laterally, without fear of compression of the spine. This has been called the *little turn.*"

These divisions are rather theoretical than practical, for if evolution be easy, it is accomplished as well by the great as by the little turn, and if it be difficult, that method which is the most rapid is the best, and the accoucheur must act according to circumstances.

Having firmly grasped the foot, traction is made, and we feel the fœtus move. In a general way these tractions should be made downward and forward, in order to bend the fœtus anteriorly. At the same time the other hand, on the abdomen over the head, endeavors to push this up towards the fundus. The tractions should ever be slow and continuous. If the version be easy evolution is rapid, but it may happen that either the head or the shoulder do not move, and evolution does not occur. We then, according to Naegelé and Grenser, try to push up this shoulder or head towards the side of the pelvis with the thumb or the palm of the operating hand, at the same time that the feet are pulled down. If this does not succeed, we may resort to what has been called double manipulation. (Fig. 11.)

This consists in applying a loop over the foot, and of pulling on it, while the hand in the uterus tries to push the presenting part upward. The uterus must be well steadied by an assistant.

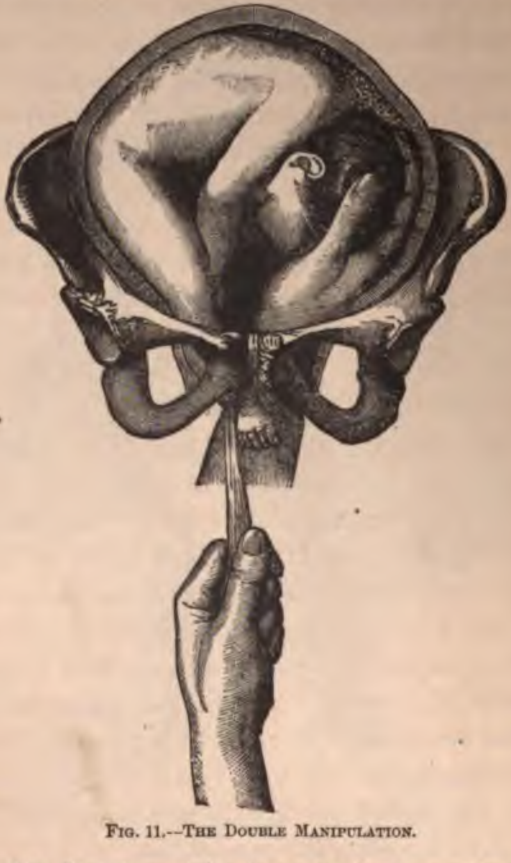


FIG. 11.--THE DOUBLE MANIPULATION.

This procedure was known to the Japanese. Numerous instruments have been devised for pushing up the fœtal part, such as those of Maygrier, Burton, Aitken, Otto, etc. All these instruments we believe are inferior to the hand, and if the hand fail, we do not think that any instrument will succeed.

Madame Lachapelle has noted in cephalic presentation a cause of difficulty when traction is made on but one foot. It depends on the fact that the nates may prevent the ascent of the head. If this cannot be pushed up, traction should be made on both feet. In certain instances version is not possible, and then our recourse must be to embryotomy.

We have said that traction should be made downward and forward; but this anterior movement must not be exaggerated, else it may happen that, when evolution is complete, the foot which was not grasped lies across the symphysis, and thus prevents further progress. Then it will be necessary to make traction directly backward, or else to rotate the dorsum of the fœtus backward, or at least laterally, in order that the thigh caught on the symphysis may disengage itself. It is always, be it understood, the anterior hip which thus gives rise to trouble.

The breech once at the superior strait, and at the level of the cervix, version may be considered at an end, and often the case may be left to Nature. We are dealing simply with a breech presentation. But if the pains are slight, if there exist disproportion between the fœtus and the genital canal, if version has been indicated by complications threatening the life of mother and child, then extraction should follow at once on version.

3. *Extraction of the Fœtus.*—The extraction, according to Naegelé and Grenser, may be divided into three stages: 1. The body of the fœtus as far as the shoulders. 2. Extraction of the arms. 3. Extraction of the head. Only, however, in difficult cases, are these stages marked; in case of favorable conditions and of strong contractions, extraction is so easy that the three stages are merged in one.

While efforts at version are to be made in the interval of, extraction is made during, the pains, and it succeeds the better the stronger and more regular the pains. If the two feet have been grasped and brought to the vulva, they are wrapped in a towel, and they are seized with the thumbs above the heels, and the remaining fingers on the ventral surface of the leg. (Fig. 12.) The same rule holds where but one foot has been brought down, the hands being moved upwards as the legs and the nates descend, keeping as near as possible to the joints. The hands thus are applied successively to the feet, the legs, the knees, the nates, as close as possible to the maternal parts. (Fig. 13.)

If traction is made on a single foot, as soon as the breech is extracted the second foot appears of its own accord. Only when the second leg has extended on the abdomen of the fœtus, need we artificially disengage it. The finger must then be inserted in the groin, in order to pull down the thigh, and then must seek the second foot and endeavor to extract it, but direct traction must never be made, else fracture will result. The best practice, in such cases, is to continue extraction irrespective of the second foot, when, sooner or later, this will spontaneously appear. If, when the nates appear, the fœtus is found astride of the cord, we must try to loosen this by passing it over the natis belonging to the undelivered foot. If the cord cannot be loosened, then it may be ligated in two places and cut between. Of course, in such event, very rapid extraction is indicated.

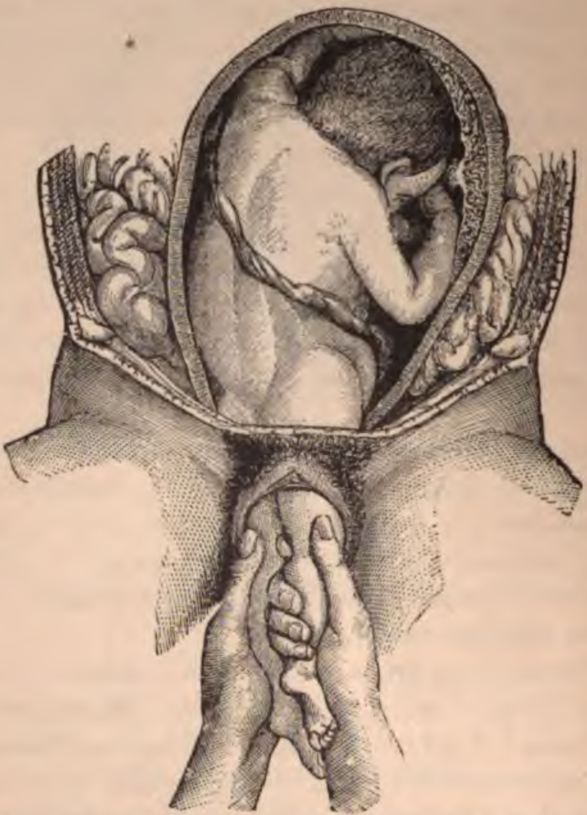


FIG. 12.—POSITION OF HANDS IN EXTRACTION. DELIVERY OF THE INFERIOR EXTREMITIES.

The breech delivered, the thumbs are applied over the sacrum, the other fingers over the anterior of the pelvis, (Fig. 13,) and traction is made downwards and slightly backwards, until the thorax appears. If the cord is tense at the navel, it is pulled gently downward, in order to avoid traction on it. If it cannot be disengaged, it must be cut and the fœtal end compressed by an assistant till extraction is completed. Usually, as the body descends the fœtus rotates, so that the dorsum looks forward. If this rotation does not occur spontaneously, it must be made artificially. In order to effect this, while downward traction is being made, the fœtus is turned in the desired direction, and this is ordinarily an easy matter. But if the body resists, rather than use force we had best desist.

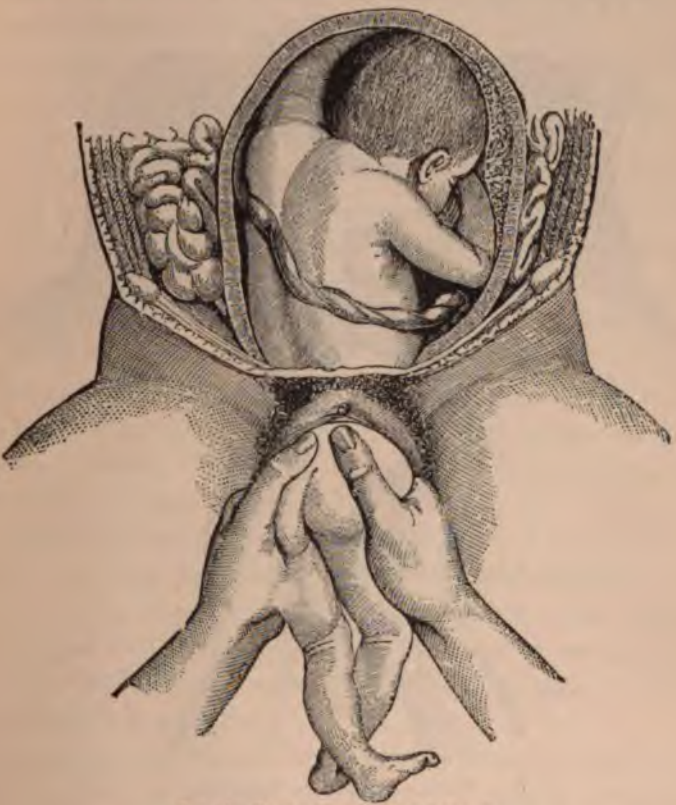


FIG. 13.—EXTRACTION OF THE BREECH.

Where version is easy and contractions good, the arms remain flexed on the chest; but if the uterus retracts more, the arms extend along the head, and must be disengaged. The posterior arm should be first extracted, and then the anterior, and there remains only the head.

The head may be flexed or extended, the occiput anterior or posterior. If the uterine contractions are not sufficient, we must extract it rapidly, lest the infant endeavor to breathe, and asphyxiate. Since the extraction of the arms and head offers difficulties, we will describe this later on.

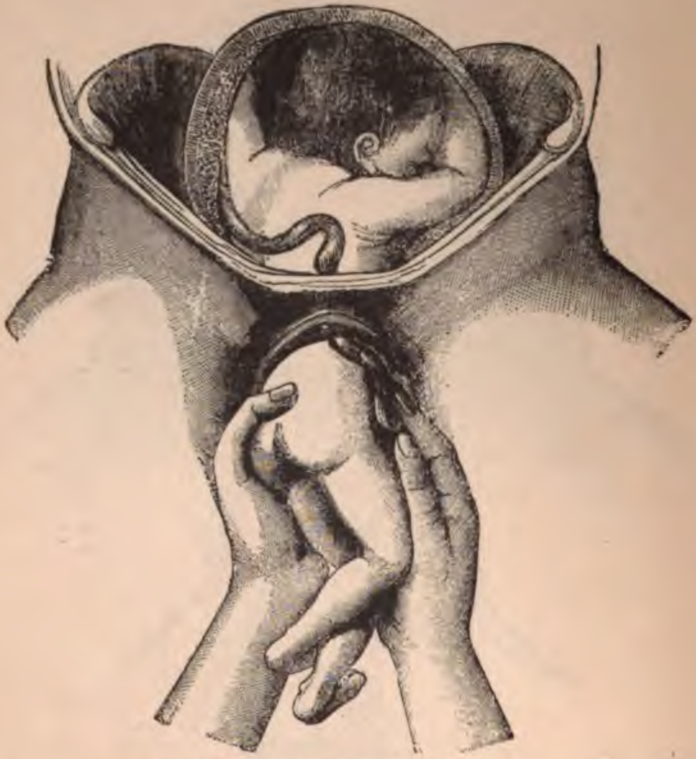


FIG. 14.—LOOSENING OF THE CORD.

The child born, the cord is to be cut as usual, and the same care is given to infant and mother as is customary after normal labor.

Version, as we have described it, is simple version. It is not always so easy, and, as we will see, the operation may become one of the most delicate and difficult the accoucheur is called upon to perform. We will pass the difficulties successively in review.

OBSTACLES AND DIFFICULTIES TO VERSION.

I. *Introduction of the Hand.*

The causes of difficulty may lie in the vulva or vagina, (edema, narrowness, rigidity), or be due to obstacles in the canal, (prolapse of the arm or the cord), in the cervix (resistance, rigidity, placenta prævia), in the uterus itself (retraction, tumors, etc.)

a. Narrowness, rigidity, of the vulva or vagina, are rarely so pronounced as to constitute genuine obstacles. Edema and traumatic swelling of the vulva and the external parts are the most frequent obstacles.

Edema of the vulva may depend on albuminuria, and in certain cases it is necessary to puncture the labia in order to affect introduction of the hand. In such cases great care is necessary in order not to bruise the parts overmuch, and thus lead to gangrene.

b. Prolapse of the cord of itself is not an obstacle to version, but the life of the child is compromised, and, therefore, active intervention is called for, and extraction should at once follow version. If the fœtus is dead, the only necessary precaution is not to pull on the cord and thus separate the placenta. If the cord be in the way it may be cut, the placental end being alone ligated, since the fœtus is dead. But we must never forget that absence of pulsation in the cord is not a sure sign of fœtal death, and that for absolute certainty we must listen for the fœtal heart. If, on the other hand, the fœtus is alive, we must particularly avoid compression of the cord. The best plan is to replace it in the uterus above the fœtal part, and if it will not stay there, to terminate version as rapidly as possible.

c. In shoulder presentations, when labor is prolonged, and the liquor amnii has in great part escaped, the shoulder is pushed more and more into the superior strait, and the arm belonging to the shoulder extends, and prolapses into the vagina, often appearing at the vulva. At times the arm is brought down by the inexperienced operator, being mistaken for the leg. The arm thus prolapsed swells, becomes livid, and at times looks gangrenous.

The older writers often placed a piece of ice in the hand to cause it to retire. Mauriceau and others advocated efforts at replacement. Portal (1665) and Deventer (1701) first proved that such efforts were often unnecessary. Smellie, Levret, Puzos, Lamotte, Van Hoorn, proved that such efforts were not only useless, but often dangerous.

To-day, this prolapse of the arm is considered an advantage, in the first place because we are enabled to make a correct diagnosis, and in the second place, because we may fix this arm and prevent it from extending along the head. We have already seen how, by looking at the hand, or by following the arm up to the axilla, we may at once differentiate the presenting shoulder, and thus know exactly where to hunt for the feet.

We must not judge the infant dead by the condition of the arm, and, as has happened, amputate it; such amputation is never necessary, however swollen it be. Our efforts must be limited to passing a sling over the arm, and thus preventing its extension along the head during extraction.

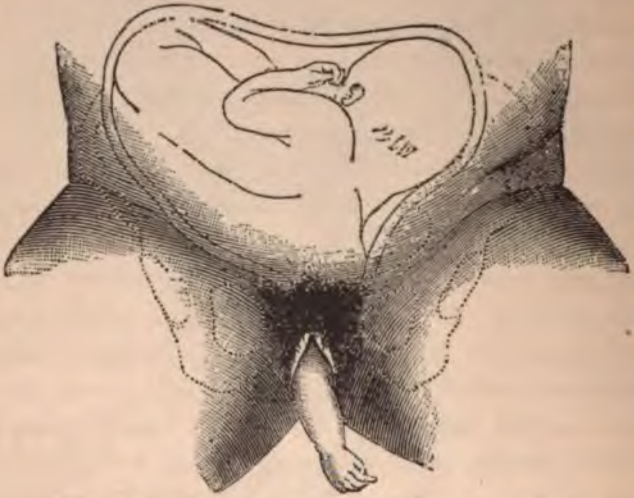


FIG. 15.—SHOULDER PRESENTATION, WITH PROLAPSE OF ARM.

There are instances, however, where the accoucheur's hand cannot be inserted, because during previous attempts at version the other arm or foot has been brought down. Then, in case of vertex presentation, destruction of the fœtus is necessary. But first we must always assure ourselves of the death of the fœtus. If the foot, as well as the arm and the head, is in the vagina, we have seen that we may have recourse to the double manœuvre, and if this fail, to perforation or cephalotripsy.

d. Obstacles in the cervix may be due to incomplete dilatation, to rigidity, to spasmodic retraction, to placenta prævia, or to tumors of one or another kind opposing dilatation.

1. *Incomplete Dilatation and Retraction of the Cervix.*—In certain cases, the life of the mother or child depends on labor being terminated before complete dilatation; otherwise we must wait for complete dilatation. Baths, hot injections, chloral, chloroform, belladonna ointment, will usually, at the end of a few hours, overcome rigidity.

[In instances where these measures fail, the faradic current, weak, and never passed through the two poles of the fœtus, should always be tried. A number of instances are on record where it overcame rigidity, and from our experience in cases of uterine inertia, we should be inclined to rank it in value after chloral, which drug is of the greatest possible utility.—Ed.]

If the mother's life or that of the infant is in danger, we must proceed to dilate the cervix. In such cases, chloroform pushed to its fullest extent has been advised. We have but little confidence in it, because the uterine muscle resists above all others the action of chloroform; its contractions have often persisted after the heart has ceased to beat. The action of chloroform is too dangerous and variable for us to be willing to compromise the life of the mother when we have at our disposal other less dangerous means.

Dilatation of the cervix may be effected in a number of ways. Gradually by the hand, or by Barnes' dilators, and then with the greatest care. We reject absolutely the metallic dilators. If gradual dilatation of the cervix be not possible, we much prefer incision. This incision, it is understood, can only be practised when the resistance is at the external os. At the internal os, the hand and Barnes' dilators should alone be used. When these fail, our only resource is in the *accouchement forcé*, however dangerous it be. Venesection, pushed to syncope, often fails.

2. *Placenta Prævia.*—The cervix, on the other hand, may at least be dilatable, and the hand is opposed by the placenta, either partially, or entirely previa. We have seen, when studying this subject, that then the placenta must be partially separated, and the hand introduced above it.

3. *Tumors of the Cervix.*—In such instances, as we have seen, we must await sufficient dilatation of the cervix, especially in the case of fibrous tumors; in case of cancer we must incise the cervix, and if this fail, resort to perforation, or to embryotomy.

4. *Obstacles in the Body of the Uterus.*—Here it is not usually so easy to overcome the difficulties. Often, indeed, either because of premature escape of the waters, or prolonged labor, or premature administration of ergot, or repeated and inexpert attempts at version, the entire body of the uterus is contracted, in a state of tetanus as it were, and the body of the fœtus is held so tightly that it is impossible to pass the hand. We must not then attempt version. To do so would inevitably cause rupture of the uterus. The fœtus must be mutilated, for thus alone can we save the mother.

II. *The Search for the Feet.*

There are a number of conditions which may interfere, and of these we mention mobility of the fœtus or of the uterus. This may be remedied, in part, by allowing a little of the liquor amnii to escape, and in part by fixing the uterus. There are two other more frequent causes, however, and these are the displacement of the feet at previous attempts at version, and the difficulty of grasping them. When the feet have been displaced, we must hunt for them by following along the back of the fœtus to the nates, thence to the thighs, and to the knees, and these, as we have seen, are firm enough to permit of version.

A further difficulty consists in *anterior position of the feet.* They are then situated above the pubes, in the hypogastric region, and, with the woman on her back, the hand cannot reach them, but is stopped by the inferior border of the symphysis. Then it is that the lateral position, and particularly the knee-elbow, are absolutely indispensable. The woman in such position, the feet become posterior, the introduction of the hand is easy, and version as well, whereas before this seemed impossible.

A more serious difficulty is, at times, inability to firmly grasp the feet. In many cases, the foot may be brought down to the upper part of the vagina, but no further, the fingers slipping, and, in order to obtain firm hold, we must pass a sling over the foot, above the ankle, in order to make sufficient traction. The application of the sling is not as easy as one might think. When the foot is outside the vulva nothing simpler; but when the foot is in the vagina, particularly high up, the operation is a very delicate one. A running loop is made, and this is passed around the left fist. Introducing this hand into the vagina, the foot is seized by the fingers as high up as possible, and pulled down. With the fingers of the right hand, the loop is pushed over the left hand, and its fingers on to the foot. Once on the foot it is pushed beyond the heel. When the two ends of the loop are pulled upon, the fœtal limb is held firmly. Unfortunately, this method, very simple in theory, is very difficult in practice. In the first place, the loop, wet by the discharges, does not slide easily over the fist and the fingers; then again, the foot may escape from the fingers, or it is difficult to push the loop over the heel, for we have introduced if not two hands, at least one and a portion of the other into the vagina.

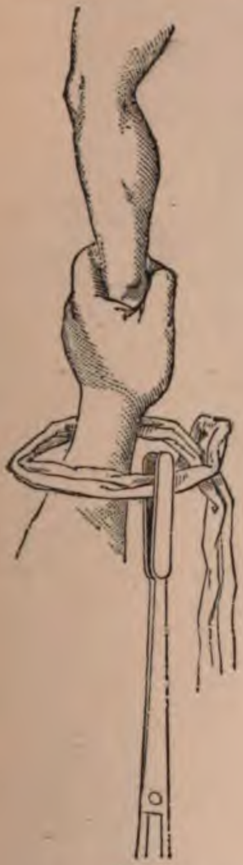


Fig. 16.

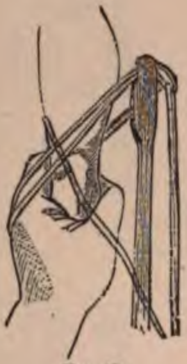


Fig. 17.

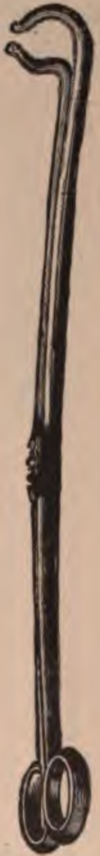


Fig. 18.

Figs. 16 and 17.—Application of Loop, by means of Dressing Forceps.
Fig. 18.—Van Huevel's Instrument.

Since the time of J. Siegmundin, many instruments have been devised for carrying up the loop, analogous to those for the cord. For instance, those of Walbaum, Stein, Van Huevel, (Fig. 18), Wasseige (Fig. 19),

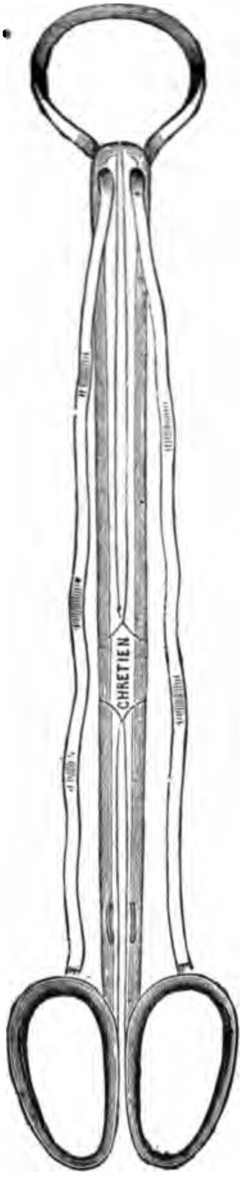
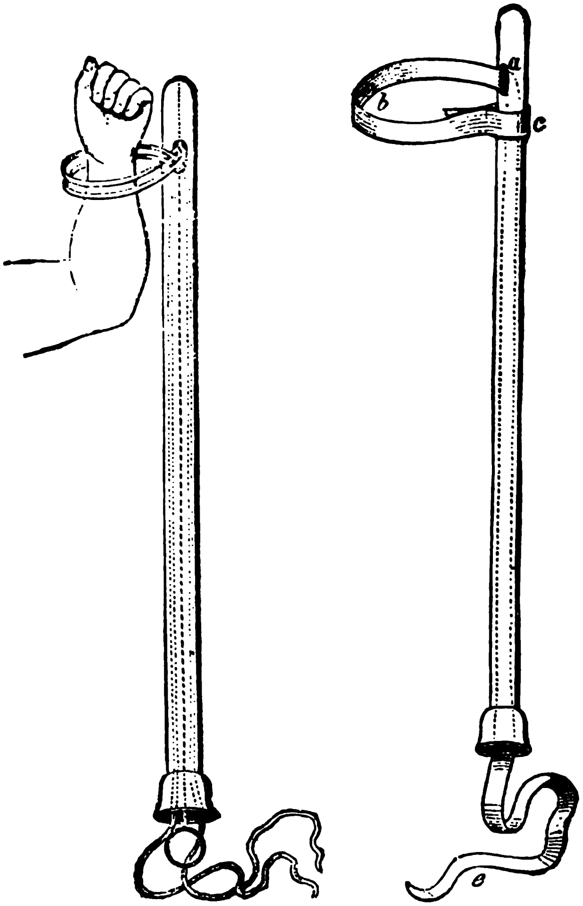


Fig. 19.—Wasseige's Instrument.



Figs. 20 and 21.—Lambert's Instruments.

Lambert (Figs. 20, 21, 22), Trefurt (Fig. 23), Hyernaux (Fig. 24), Morales (Fig. 25, 26), and all have about the same value.

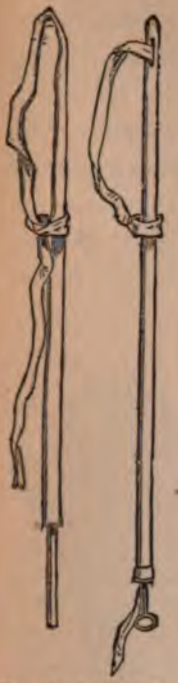


FIG. 22.—LAMBERT'S INSTRUMENTS.

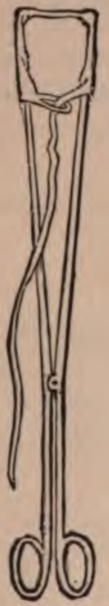


FIG. 23.—TREFURT'S INSTRUMENTS.

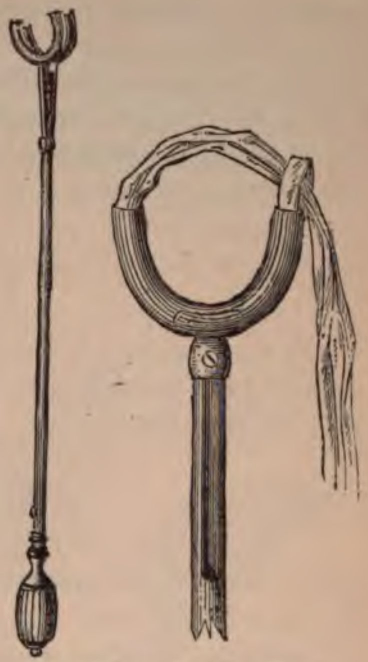
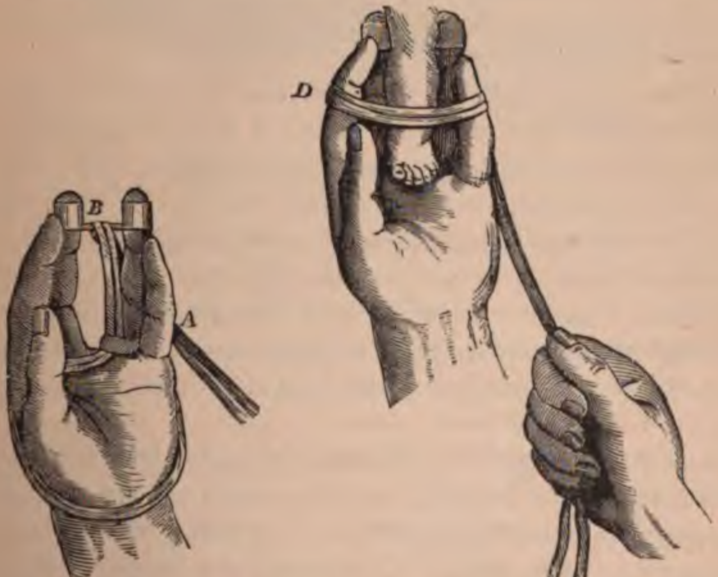


FIG. 24.—HYERNAUX'S INSTRUMENTS.



FIGS. 25 and 26.—MORALES' SLINGS.

The same is true of the forceps invented to carry the loop (Figs. 16 and 17), and those for seizing and bringing down the feet. (Those of Bang, Groning, Nevermann, Lazarewitz.)

Of all the above instruments, the best is the hand. It is not often that the method by the hand fails, and the loop once in place we may make every necessary traction to extract the foot.

III *Evolution.*

Here the obstacles are dependent on fœtal mobility. Whenever the obstacles to evolution are very great, we must desist from version, and resort to embryotomy.

IV. *Extraction of the Fœtus.*

We have already mentioned short and tense cord, and the means at our disposal. We must now study the difficulties offered by the arms and the head. If, indeed, uterine contractions are weak, if the cervix resists delivery, if tractions are made in the pain-intervals, the arms are extended above the head, and this is a grave complication, seeing that the body of the fœtus having been delivered, the infant may endeavor to breathe, and asphyxiates.

1. *Extraction of the Arms.*—The arms may be extended in two ways: either from above below, and from behind in front, or else from above below, and from in front behind, that is to say, crossing behind the neck. We must first determine in which of these two ways extension has occurred, for we must always, in order to extract them, make them follow the same route traversed in extension. The angle of the scapula will tell us this. If the arms have extended from behind in front, the inferior angle of the scapula will be at some distance from the vertebral column, while if extension has occurred from in front behind, then this angle will be near the vertebral column.

Extraction of the arms must be performed gently, beginning with the posterior, for we thus gain space for the extraction of the anterior and more difficult arm. Often extraction of one arm is sufficient, for the other, as we have seen, may be in the vagina, and to prevent the ascent of this during evolution, a noose is slipped over the wrist and gentle traction made.

In order to extract the posterior arm, the body of the fœtus must be lifted upward by one hand, while the fingers of the other are gently insinuated towards the axilla. The thumb is then placed on one side of the humerus, and the remaining fingers on the other; the fingers are slid along this bone to the elbow. Seizing this joint, the arm is pulled from behind to the front, passing successively over the face and the chest, out at the vulva. (Fig. 27.) In a word, traction should ever be made at the joint, in order not to fracture the bone, and the arm be made to follow the inverse course it took during extension. Where the arm is extended from in front back, the same manœuvre is indicated, except that the arm is passed over the occiput and the neck of the fœtus. This latter form is rare.

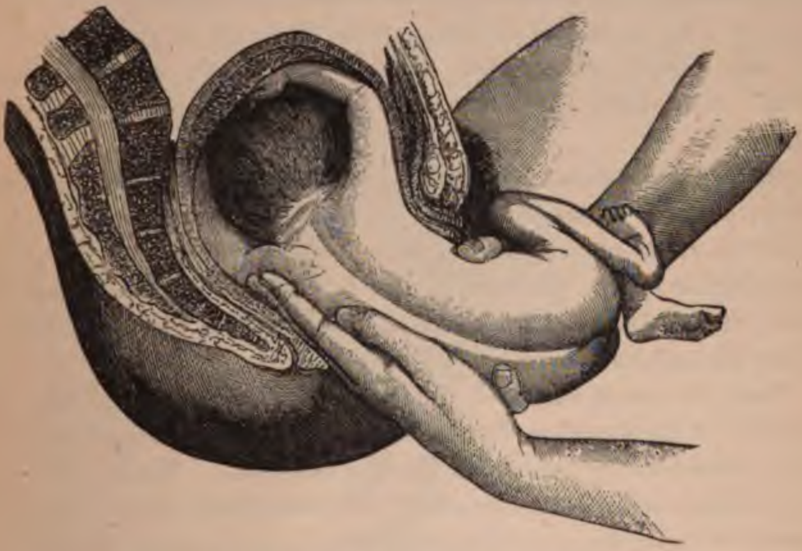


FIG. 27.—EXTRACTION OF THE POSTERIOR ARM.

The posterior arm disengaged, we turn to the anterior. The body of the fœtus is depressed as much as possible and the arm disengaged in the same manner. In general the left hand is used for the posterior arm, and the right for the anterior. Before extracting the arms, Baudelocque and

Rossirth advise traction on the shoulders, thus approaching the arms one to another, and the neck is more readily accessible.

Hüter recommends the following method: "He seizes with both hands the thighs, lifts them up and brings them together, drawing them more and more towards the maternal abdomen. Then introducing the hand, he finds the posterior shoulder so low, that he can readily reach the elbow and extricate the arm. He then seizes the thorax with both hands, and turns the fœtus on its longitudinal axis, so as to make the anterior arm posterior, and its extraction is easy. A necessary consequence of the elevation of the lower extremities is descent of the posterior shoulder, only we must be careful in lifting up the thighs not to pull so hard as to cause descent of the head, which would greatly complicate matters." This method, it is seen, is only a modification of Naegelé and Grenser's.

Madame Lachapelle, Simpson, Cazeaux and Barnes, have especially drawn attention to the arm behind the head. Barnes believes that it is often the result of inexpertness, while Dugés and Cazeaux believe that this accident may be produced in two ways: either the arm crosses the neck, after it has extended above the head, or else the arm extended along the back and was stopped at the occiput.

When the ventral surface of the fœtus has remained forward until the delivery of the shoulders, extraction of the hands is no longer difficult, as is pointed out by Dubois and Madame Lachapelle. The shoulders are still oblique, and it suffices to extract the posterior arm first. If it is not possible to bring the arm in front of the face and the thorax, Naegelé and Grenser advocate pushing back the elbow to the outside and behind, and at once to extract the anterior arm first.

2. *Extraction of the Head.*—The first obstacle which may offer, is the retraction of the cervix around the neck. If energetic traction is made, the result may be separation of the body from the head. If we do not act rapidly, the child will die. When the fœtus is dead, we can wait for the cervix to relax, but otherwise we must try every means, baths, inunctions of belladonna on the cervix, chloroform, venesection to syncope, etc., to overcome the spasm. If the spasm is limited to the external os, we may try incision of the cervix and the forceps. If, however, the spasm is at the internal os, and we cannot reach it with the fingers to dilate, we must wait till the fœtus is dead, and then resort to perforation or the

cephalotribe. Even when we resort to incision and the forceps, we rarely save the fœtus, for, however quick our actions, the infant has time to make efforts at inspiration, and dies.

Besides this obstacle, there are four difficulties dependent on the manner in which the head engages:

1. Occiput in front, and head flexed.
2. Occiput in front, and head extended.
3. Occiput behind, and head flexed.
4. Occiput behind, and head extended.

1. The head is extracted without the least trouble. It suffices to lift the body towards the maternal abdomen, in order to extract the head. The perineum calls for special care.

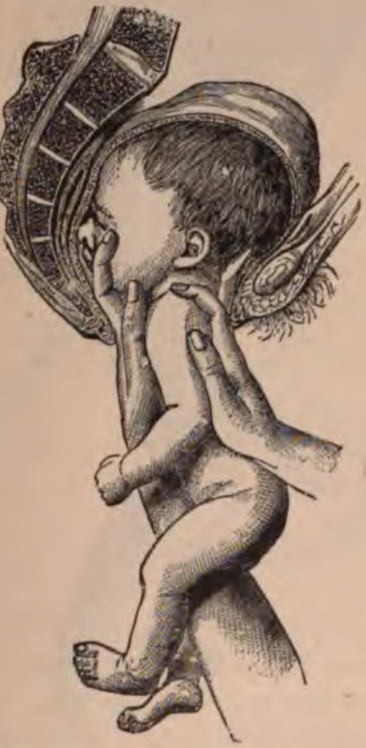


FIG. 28.—VEIT'S METHOD. (Mauriceau's Method.)

2. The first thing to do is to flex the head. In 1668 Mauriceau de-

scribed at length the operative method which, to-day, bears the name of Smellie, or of Veit, and which should in reality be called after Mauriceau. (Fig. 28.) The method consists in lifting the body of the fœtus upward with one hand, and applying the index and the middle finger of the other hand each side of the nose, on the superior maxilla, and pulling the face downward the head is flexed. If we do not thus obtain flexion, one or two fingers are introduced into the mouth to the base of the tongue, and using the inferior maxilla as a fulcrum, the face is pulled down. The

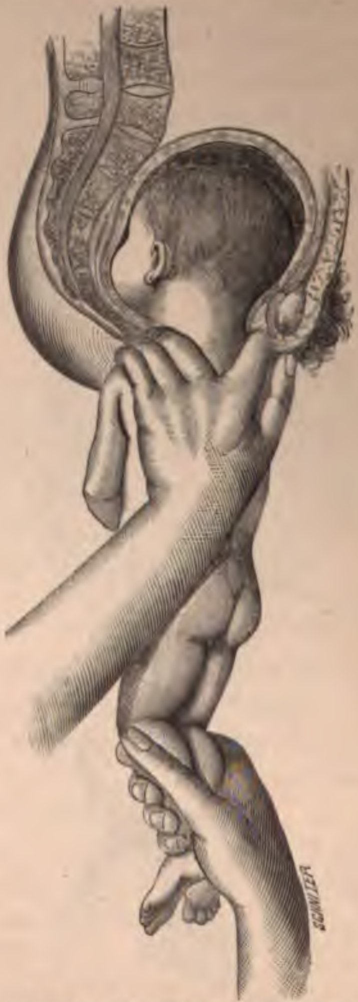


FIG. 29.—PRAGUE METHOD, FIRST STAGE.

head once in the excavation, the two fingers are again placed on the superior maxilla, and while by them we seek to lower the face, the occiput is pushed upward by the index and the middle finger of the other hand, so as to assist in flexion. This once accomplished, the body is lifted towards the abdomen of the woman, and, as in the preceding instance, the fœtus is delivered with its back to the mother's abdomen. Traction should always be made backwards.

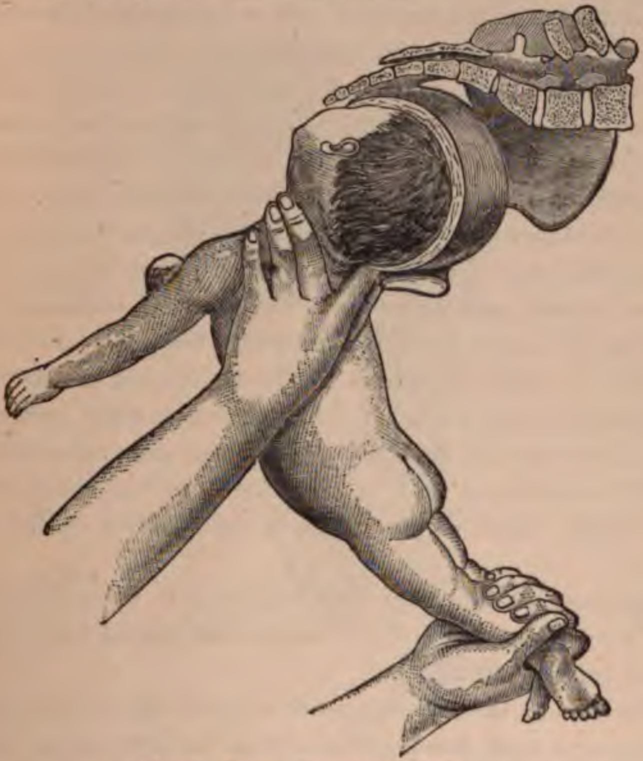


FIG. 30.—PRAGUE METHOD, SECOND STAGE.

Under the name of the Prague method, Kiwisch and Seyfert have described a process which varies but little from that already advocated by Puzos, and used by P. Dubois. It may be performed in two stages: 1. When the head is high up, the body of the fœtus is carried backward towards the perineum, the fingers are applied over the shoulders, and traction is made downward and backward. If uterine contractions are defective, Kiwisch adds to this traction pressure exercised over the head through the abdominal walls.

Once the head in the pelvis, the other hand seizes the limbs of the fœtus, and lifting the body rapidly towards the body of the mother, keeping up traction through the fingers applied over the shoulders, the fœtus is delivered.

If this method do not succeed, forceps must be applied and the head extracted.

While this method often does succeed, it nevertheless frequently exposes the infant to serious accidents, such as dislocations, fractures of the vertebræ, etc. Hecker, Martin, Gusserow, have cited examples of fracture of the vertebral column, and of decapitation, and Ruge, in his monograph on the fœtal lesions following on extractions in pelvic presentations, reports a number of accidents to which this method exposes the fœtus. Scanzoni, nevertheless, is greatly in favor of a method which saved the lives of 117 infants out of 152 delivered at the Prague Maternity.

Finally, Champetier de Ribes from a careful study of all these methods, and from his own experience, draws the following conclusions: "The best method of making the head pass through the pelvis after delivery of the trunk is: 1. Make the inferior maxilla the fulcrum in order to determine the flexion of the head. 2. At the same time make backward traction. 3. Associate with these manœuvres abdominal expression made by the hand of an assistant, not over the entire head, but more particularly over the frontal region of the fœtus, in the direction of the superior strait."

If Champetier de Ribes has thus been able to cause a head to pass through a pelvis contracted to 2.9 inches, this method ought to succeed where the pelvis is normal.

3. Extraction in these cases is nearly as simple as when the occiput is in front and the head flexed. The body of the fœtus should be carried forward towards the abdomen of the mother. Delivery is thus accomplished belly to belly; only, since the occiput is posterior, we must watch the perineum all the more carefully.

4. In this case, the chin being more or less fixed behind the pubes, to pull on the body before having extracted the chin will only complicate matters. As long as the head occupies the antero-posterior diameter of the pelvis, the chin cannot be depressed. We must then, before attempting flexion, cause the head to rotate. For our part, the only way to obtain a living infant, is to apply the forceps, artificially rotate the head, and

deliver at once. It has been advocated, nevertheless, in these cases, to rotate the head with the hand. Such is the advice given by Madame Lachapelle, and Naegelé and Grenser; but, while Madame Lachapelle immediately extracts the head with the hand, the latter apply the forceps after rotation. The following is the method of Madame Lachapelle: The hand is introduced into the concavity of the sacrum, and surrounds the head until it reaches the mouth, and the index and the middle fingers are introduced into the mouth, and while the other hand or an assistant pulls on the trunk, the head is made to rotate. At the same time, the attempt is made to depress the chin, and to make the head descend. As soon as the chin points backward, flexion is completed and the head delivered as usual. Naegelé and Grenser rarely seize the child by the mouth, but passing the hand around the head to the opposite cheek, and seizing the face in the open palm, they try to bring the head down and at the same

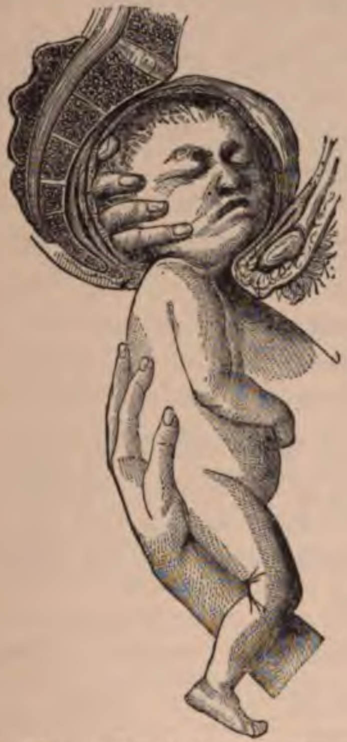


FIG. 31.—EXTRACTION OF THE HEAD. Method of Madame Lachapelle modified by Naegelé and Grenser.

time to rotate it backward. This manœuvre can only succeed where the head is large and the pelvis small.

Finally, in addition to the above complications, version may be rendered difficult by disproportion between the fœtus and the pelvic diameters.

The reader is referred to the subject of contracted pelvis for information on this point.

FREQUENCY AND PROGNOSIS OF VERSION.

It is nearly impossible to make any distinct statements in regard to version, for aside from transverse presentations, many authors prefer it to the forceps, while others, and we are of this number, much prefer the forceps when it is possible to use it.

Thus while Sickel found the proportion to be nearly 1.3 in 100 labors, Ricker found it to be .81 in 100, and in 530 cases where the cause was noted, we find:

Transverse presentations, . . .	73.2 per cent.
Placenta prævia, ...	15.4 "
Prolapse of the cord	5.2 "

Ploss, from his researches found: 3,575 versions in 316,891 labors in the German hospitals, or 1 in 88 cases, 214 versions in 67,129 labors, in England, or 1 in 313. In France, 1 in 110.

The following statistical tables show the differences, according to the authority and country:

Versions at the Paris Clinic. (*Depaul.*)

	No. of Cases.	Mothers.		Children.		No. of Labors.	Mortality.	
		Living.	Dead.	Living.	Dead.		Mothers.	Infants.
From 1852 to 1880.	172	148	24	86	86	21.615	13.9%	50%

[The table has been condensed so as simply to give the totals. A second elaborate table gives the results in the German, Swiss and Russian Maternities from 1789 to 1865. The total number of confinements was 316,891 with 3,575 versions, or 1 in 88 labors.—Ed.]

As for the prognosis, if version, practised at the time of election, that is to say, under the most favorable conditions, is, in general, not a serious operation for either the mother or for the child, it is not always so, and unfortunately favorable conditions are rarely present in the majority of cases where we are called upon to perform version. (We are speaking now, of course, purely of podalic version by internal manipulation.) The less the amount of liquor amnii, the longer the duration of labor, the greater the contraction of the uterus, particularly if repeated attempts at version have been made, the more difficult the operation, and the graver the prognosis for mother and for child. The more expert the operator, the greater the chances of success. As for the mortality statistics, it is impossible to give accurate figures, for the reason that the cases where version was easy have not been separated from those where it was difficult, nor, further, into classes according to the indication calling for operation. The most we can say is that the infantile mortality is far in excess of the maternal.

From Zweifel's figures we learn that of 53 cephalic versions, 70 per cent. of the children were born alive, and only one mother died; the infantile mortality rate was thus 28.3 per cent., and the maternal 2 per cent. These figures seem high, but many of the versions were performed during labor by Braxton Hicks's method; whilst cephalic version as we practise it, purely by external manipulation made during pregnancy only, is absolutely inoffensive both for the mother and the fœtus.

Podalic version, internal, is, on the other hand, more serious. According to Zweifel, of 3,475 cases, 1,434 infants, 41.2 per cent. were born alive, whilst 58.9 died. Of 3,475 versions, 8.4 per cent. of the mothers died.

Madame Lachapelle lost one child out of every 3.96; Carus, Osiander, Kiwisch, Michaelis, 1 out of 2; Ricker, 1 out of 10; Hüter, 1 out of 14; and Churchill, out of 542 versions, taken indiscriminately, lost 1 child out of 3 and 1 mother out of 15.

Sickel, out of 447,163 children, noted 3,781 versions—that is to say, 1 out of 118.10; of which 3,703 were podalic version, by one or two feet,—1 out of 120.28; and 78 cephalic, 1 out of 5,732; of 3,475 infants born by podalic version, 1,434 were born alive, and 2,041 dead. Of the same number of mothers, 3,184 were living and 291 dead.

The reason for the gravity of this operation is evident, when we remember the complications and the obstacles which we have noted. Whenever, then, there is room for choice, we much prefer the forceps to version. The forceps, in skillful hands, is an inoffensive instrument.

Version, in skillful hands, is always a serious operation, and we cannot better impress this than by repeating the words of our master, Depaul: "With my forceps, I am perfectly at ease, for I am sure of never doing harm, while I never perform version without apprehensions." We must remember, however, that what complicates version is the extraction of the fœtus. Aside from traumatic lesions to which it is liable, the gravest danger for the fœtus is the retention of the head and the consequent asphyxia. Therefore certain authors have endeavored to make the infant breathe, while the head is still in the pelvis. Pugh advocated introducing two fingers into the mouth, forming a gutter with the hand for the air to pass along, and later devised a special canula for bringing the air to the fœtus. Similarly with Weidmann, Hecking, Blick, the younger Baudelocque.

All these methods seem to us theoretical rather than practical, and we had better spend all our time in extracting the fœtus. The same criticism applies to the proposal of Wigand and of Ritgen, to apply a ligature to the cord as soon as the body is born, and thus to prevent cerebral anæmia. It is not anæmia which kills, but asphyxia, and again, therefore, the best remedy is to deliver the child as soon as possible.

We append Pajot's table, wherein are resumed the rules for podalic version.

Pelvic Version after Pajot.

We must not think of version unless: the os is dilated or dilatable: the head must be above the brim: intact membranes are favorable.

Version is indicated whenever the life of the child or mother is in danger. When circumstances allow of choice, forceps should be preferred.

Version may be divided into:

1st *Stage*. Introduction of the hand and search for the foot. Manipulate only in the pain intervals.	Introduce hand, cone-shaped, into vagina: Rupture membranes: Enter uterus gently: Seek the feet by the shortest route: Seize the feet—one is enough. The diagnosis of position has been made, if possible, beforehand.	1st. *Position not known:* Endeavor to make out as exactly as possible. 2d. *Narrow vagina:* Not serious. 3d. *Arm in the vagina:* NEVER AMPUTATE. *If version is possible*, a loop around the hand to prevent retraction during evolution. *If version is impracticable*, embryotomy. 4th. *The fœtal part is in the way:* Push it up. 5th. *The feet cannot be found:* Hunt for them along the lateral and posterior surface of the fœtus. Pass the hand to the fundus and search carefully, but thoroughly.

2nd Stage. Evolution. Same in regard to manipulations.	Extend the leg gently: Pull the foot to the vulva, bending the fœtus on itself, so as to bring the vertex to the fundus, and the back towards one of the cotyloid cavities.	*Uterine contraction* about the only obstacle. If the head tends to engage with the feet or foot, noose over the feet, and push the head up with one hand, while making traction on the noose by the other.
3rd Stage. Extraction. Manipulate only during contractions—*except in emergency,* inertia, hemorrhage.	Wrap the foot, or feet, in a towel: Make traction in the axis: Seize the parts near to the mother: Be careful of the cord: If the arms make exit spontaneously, simply lift forward the body.	1st. *If it is impossible to finish with one foot, bring down the other,* placing first a noose over the first. 2d. *Extension of the arms over the head:* Bring down the posterior arm first. 3d. *The head does not rotate:* Cause artificial rotation. 4th. *The occiput is in the sacral excavation:* Head flexed—carry the back of the fœtus backward. Head extended—carry the fœtus towards the belly of the mother. If extraction is impossible—forceps.

CHAPTER II.

THE FORCEPS.

History.

AS Schroeder has well said, obstetrics remained so long in the hands of the midwives, from the lack of proper instruments to save the mother and the child, and because the accoucheur only interfered in case of fœtal death. Not that the ancients did not endeavor to devise means for extracting living infants, but they had recourse either to more or less complicated manual means, or else to dangerous or imperfect instruments, and, therefore, the death of the fœtus was necessarily the result of their manipulations.

In the eleventh century, Avicenne devised an instrument for saving the child, and in 1554 Jacques Rueff described a similar one. It was not, however, till 1647, that the Chamberlens invented the true forceps. Up to 1721 the instrument had to fight its way into favor, for, in that year, we find Lamotte absolutely condemning it. Times changed, however, and to-day this remarkable and inoffensive instrument saves an incalculable number of children, who otherwise would almost infallibly die. And what modifications in the instrument since the days of the Chamberlens. From Chamberlen to Tarnier! We simply aim below to describe the most important modifications of an instrument which now resembles only in principle the first forceps of Chamberlen and of Palfyn.

Description of the Principal Forceps.

In 1618 Dr. Causardine found, in an old chest in a house formerly inhabited by the Chamberlens, four models of forceps, and it is thus proved that to them belongs the honor of having devised this instrument, although, to their shame be it said, they concealed for many years an instrument so useful to humanity. In 1688 the forceps was sold to Roonhuysen, and by him to Nicholas Boelkmann and to Ruysch, and it was not generally known till 1753, when Jacob de Vischer, and Hugo de Poli, who had bought it from the wife of Jean de Bruyn, under the name of Roonhuysen's lever, described it. The original Chamberlen forceps consisted of two fenestrated branches, crossed, and articulated by a pivot, like that of a pair of scissors. (Figs. 32, 33, 34.)

In England, from 1668 to 1728, Drinkwater, Giffard, and Chapman, used the Chamberlen instrument, and in 1713 Palfyn, of Gand, presented to the Paris Academy of Medicine a forceps composed of two blades, not crossed, not fenestrated, greatly curved. (Fig. 35.)

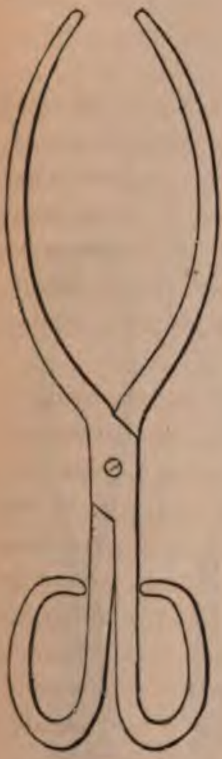


Fig. 32.—Chamberlen Forceps.

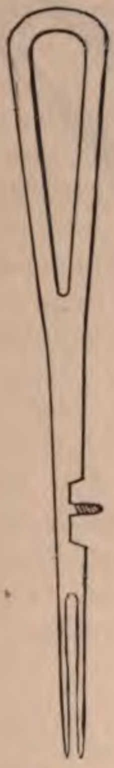


Fig. 33.—Male Blade.

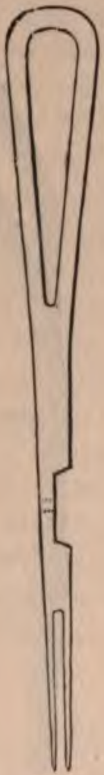


Fig. 34.—Female Blade.

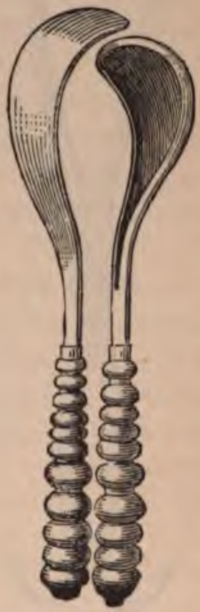


Fig. 35.—Palfyn's Forceps.

In 1733, Dusée modified this forceps by increasing the curve of the blades, and adapting to the handles two hooks turned outward.

In 1734 to 1735, Giffard and Chapman used fenestrated blades. It was not, however, till 1747, Levret, and 1752, Smellie, that the forceps was much perfected. Up to the time of the former it was straight, and he gave it the pelvic curve. Five years after, Smellie gave it a still greater curve in order to adapt the instrument to the head above the brim, and further lengthened the blades. (Figs. 36, 37, 38.)

Since then the modifications in the forceps of Levret and of Smellie are only in slight details, and Levret's forceps is still the type of all others.

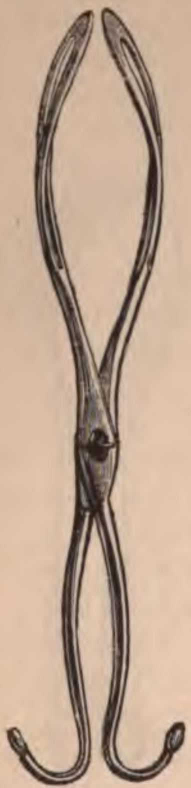


Fig. 36.—
Levret's Forceps.

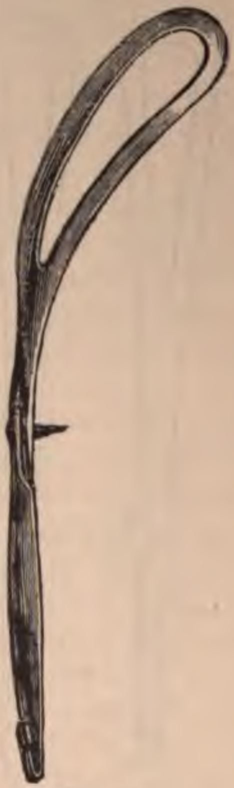


Fig. 37.—
The Same, in Profile.

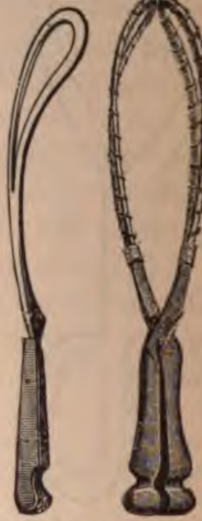


Fig. 38.—
Smellie's Forceps.

Every forceps is composed of two blades—the male, the left blade, because it goes to the left of the pelvis, the pivot blade; and the female, the right blade, the lock blade. Each blade is made up of a fenestrated portion, an articular portion, a handle.

The blades are always fenestrated, in order to make the instrument light, and that it may the better adapt itself to the head. They present a double curve along the borders and along the inner surface. The former is Levret's pelvic curve. The blades alone enter the pelvis.

The articular portion varies with the country and the instrument.

The handles are for manipulating the instrument, and are terminated by two hooks turned outward. They unite at the lock, or articular portion.

Levret's Forceps were variously modified, and are thus described by Naegelé and Grenser: "His first instrument was 18.9 inches long, of which 6.8 belonged to the blades. It was fenestrated, and the internal surface was scooped out like a gutter. The handles were of metal, and ended in hooks turned outward. The cephalic curve was slight, and the ends of the fenestræ were 2.7 inches apart. His second instrument possessed the new curve; the extremities of the fenestræ were 3.4 inches above the horizontal line when the forceps lay flat. Its length was 17.2 inches, 7 inches of which belonged to the handles; the greatest width between the fenestræ was 3.6 inches. It had a screw lock.

Finally in 1760, Levret perfected his instrument, and it is described by his pupil Stein. It is 16.4 inches long, the pelvic curve is 2.3 inches, the greatest width of the fenestræ 2.1 inches. The extremities nearly meet. The fenestræ are prolonged to the lock, so that a filet may be passed. The lock is a key. (Fig. 36 and 37.)

Smellie's Forceps.—Two in number, a long and a short. "The short (Fig. 38) has no pelvic curve. It is 11.7 inches long, 4.7 for the handles, and 1.9 between the fenestræ, the extremities of which meet. The handles are of metal lined with wood. They have a sink lock. The long forceps, is 13.3 inches long, 5 inches of which is handle; it has a pelvic curve, 1.8 inches high." (Naegelé and Grenser.)

Classic Forceps.—French Forceps.—Forceps of Dubois, Pajot. (*Figs.* 39, 40, 41.)

This is simply Levret's, slightly modified. It is composed of two branches, each divided into blade, lock, handle. The instrument is of steel, light and solid. It is nickel-plated. The mean length is 17.5 inches, from the end of the fenestræ to the lock 9.3 inches, from the lock to the end of the handles 8.1 inches. When the instrument is flat the fenestrated portion is 3.1 inches above the horizontal line. The greatest width between the blades is, at 1.5 inches from the extremity, 1.9 inches. The fenestra is 1.1 inches wide. The weight is about two pounds. The instrument has both a cephalic and a pelvic curve. In order that the pelvic curve may be exact, Tarnier says that the extremities of the fenestræ should be 3.4 inches above the horizontal line. The handle-ends have hooks, the one concave and sharp, and the other, curved nearly at right angles, is also sharp and may answer for a perforator.

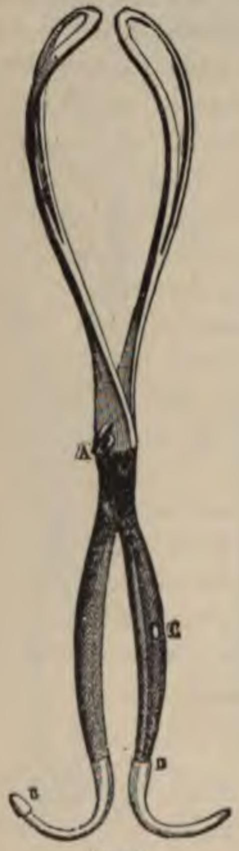


FIG. 39.

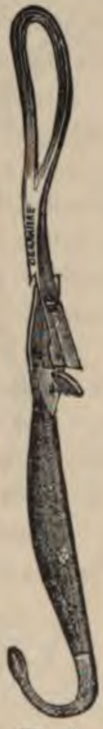


FIG. 40.

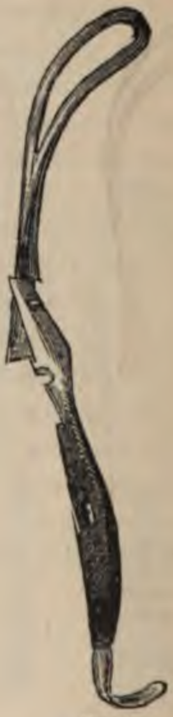


FIG. 41.

FIG. 39.—CLASSIC FORCEPS.—*A*, Lock. *B*, Olive, holding sharp point. *D*. Blunt hook, containing a perforator.

FIGS. 40 and 41.—BLADES OF FORCEPS OF PAJOT, WITH DISARTICULAR BRANCHES.

The articulation is by a pivot lock.

Figs. 40 and 41 represent the jointed forceps of Pajot. This joint makes the long forceps more portable without taking away from its solidity.

When the head is below the brim, Pajot uses a short forceps, which is only 12 in. long. (Fig. 44.) The branches disarticulate at their middle, to receive blades of larger size. (Figs. 42, 43.)

The Forceps of Brunninghausen has a lateral articular cleft, but the pivot lock is replaced by a flat projection, and the articulation is made firm by the pressure of the two hands.

Naegelé's Forceps (Figs. 45, 46, 47) is simply Brunninghausen's modified. Its length is 15.8 inches, of which 6.8 inches is for the handles. When the instrument is closed, the blades are separated, above the lock, at an angle of 39 degrees. The superior extremities are .42 of an inch apart. The greatest width between the fenestrated portions is 2.6 inches. The length of the blades is 8.9 inches, the greatest width is 1.6 inches. They narrow down towards the lock. The handles are of metal lined with wood. The lock is like that of Brunninghausen's. The handles have lateral projections.

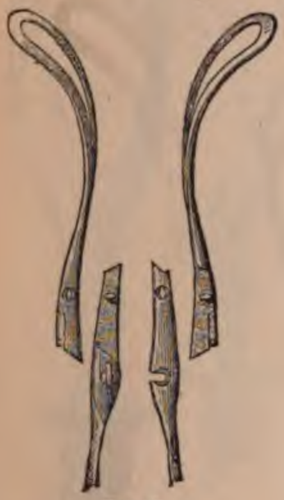


Fig. 42.

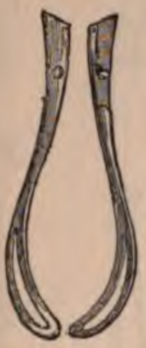


Fig. 43.

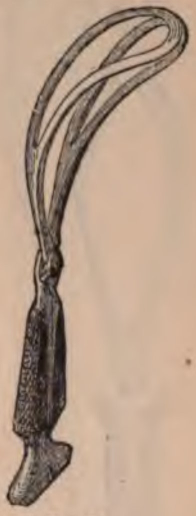


Fig. 44.

Fig. 42.—Pajot's Forceps.

Fig. 43.—Small Blades, attachable to Handles of preceding Instrument, to make a second Straight or Curved Instrument.

Fig. 44.—Pajot's Forceps.—Lateral cleff, for use at inferior strait.

Simpson's Forceps is 14 inches long, according to Tarnier; the length of the handle is 5 inches, that of the blade, from the lock to the curve, is 2.34 inches, the fenestra measures 6.24 inches, the greatest width is .46 inches from the extremity, and measures 1.6 inches. When the forceps is locked, the greatest width between the blades is 2.9 inches; the distance between the extremities is .97 inches. There is one special point in the construction: Immediately above the lock, the blades separate sharply, and then turn at about a right angle to proceed parallel up to the fenestræ. The lock is like Smellie's. The handles are of metal covered with wood.

Stoltz's Forceps (Fig. 49) is thus described by Aubenas, the translator of Naegelé and Grenser: "This forceps is not quite as long as the Parisian, and a little longer than the usual German forceps. It is 16.3 inches long, measuring 8.5 inches from the lock to the end of the fenestræ, and from the lock to the end of the handles 7.8 inches. The blades are fenestrated for 5.4 inches. The greatest width of the fenestræ is at the junction of the upper with the middle third, and is .078 of an inch. The greatest distance apart of the fenestræ is at the upper third of the ellipsoid, and is 2.73 of an inch. The separation begins at 1.5 inches from the lock, and the curve begins at 3.9 inches from this point. At the extremity the blades are .39 of an inch apart. The blades are concave.

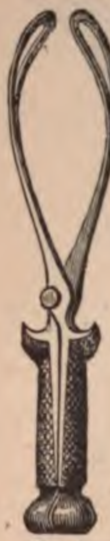


FIG. 45.—
NAEGELE'S FORCEPS.

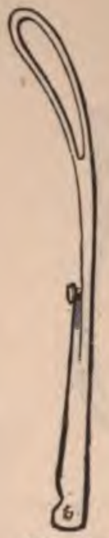


FIG. 46.—
MALE BLADE.

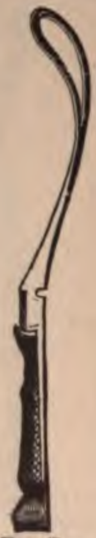


FIG. 47.—
FEMALE BLADE.

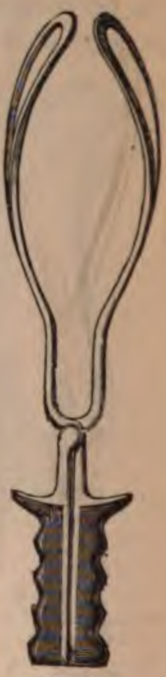


FIG. 48.—
SIMPSON'S FORCEPS.

"It results from this disposition of the blades that they are longer than is customary; the fenestræ are wider open; the curve on the flat is more pronounced; the separation is greater than usual; the ellipsoid is near the extremities.

"The handles are of roughened wood, with two lateral wings, with articulations, whereby they may open and shut.

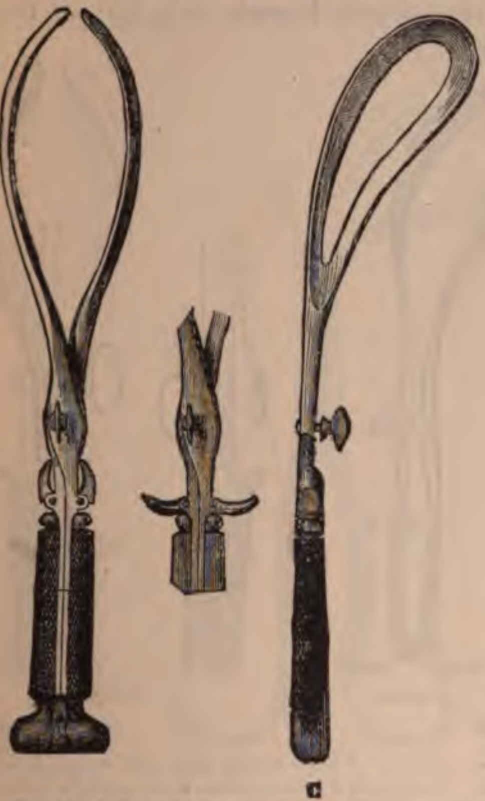


Fig. 49.—A, Stoltz's Forceps Closed. B, Lock. C, Male Branch.

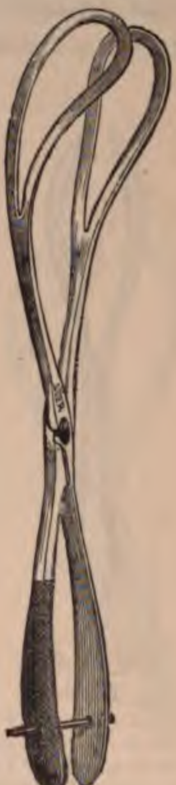


Fig. 50.—Trelat's Forceps.

"Such is the instrument which Prof. Stoltz has used for twenty-nine years, and which is praised by all who use it."

Trélat's Forceps (Fig. 50) is less massive and heavy than the ordinary. It is 15.9 inches long, and the greatest width of the fenestræ is 1.8 inches. The blades are rounded, and polished on both surfaces. The lock is Brunninghausen's. The handles have no hooks, and near the end are perforated for a steel rod, which aids in traction. This forceps is peculiar from the great elasticity of its blades, and therefore they can adapt themselves to the fœtal head with less risk of injury.

All the above forceps necessitate the introduction of the right blade first, else the blades will cross, and to obviate this the following forms have been devised.

Forceps of Thenance (Fig. 51); of Valette (Fig. 52); of Tarsitani (Fig. 53); of Antoine Petit (Fig. 54); of Baumers (Fig. 55); of Campbell (Fig. 56); of Mattei (Fig. 57.)

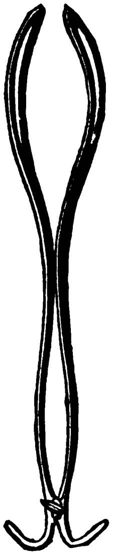


FIG. 51.

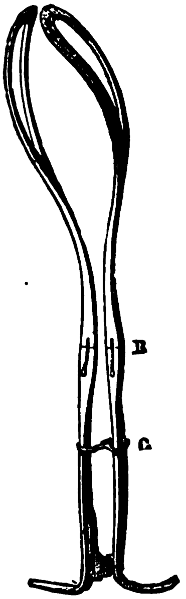


FIG. 52.

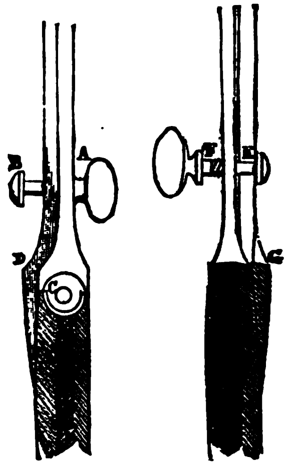


FIG. 53.

FIG. 51.—THENANCE'S FORCEPS.

FIG. 52.—VALETTE'S FORCEPS.

FIG. 53.—TARSITANI'S FORCEPS.—*A*, Pivot. *B*, Screw in right blade when forceps is articulated above. *D*, Projection of left blade. *C*, Articulation of right blade. *F*, Screw, from right to left. *E*, Right blade. *G*, Projection of left blade.

Finally, we may mention the *leniceps of Mattei* (Fig. 58), and the *retroceps of* Hamon (Fig. 59). The latter, in common with all others but the inventor, we reject absolutely. Its acceptance would, as Tarnier says, be going back two hundred years.

Chassagny's Forceps. (Fig. 60.) Chassagny was the first to endeavor to apply to difficult labor in the human species mechanical traction, used for a long time by veterinary surgeons in parturition of the larger animals.

In his forceps the ellipsoid of the ordinary instrument is done away with. "The handles are straight, except at the ends where they are slightly bent. The lock is through a transverse piece, which may separate the blades, which are thus held apart throughout their entire length. The blades are flexible and elastic." (See Chassagny's book, *Method of Continuous Traction*, for complete description of instrument.)

Traction is not made by the handles of the instrument, but through two cords attached to the middle of the blades, at the extremity of a fixed line, passing through the bi-parietal diameter. The pelvis, and not the accoucheur, directs the head; it is free to turn, in every sense, around its transverse and longitudinal axes.

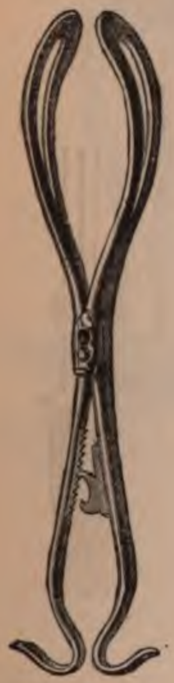


Fig. 54.—
Petit's Forceps.

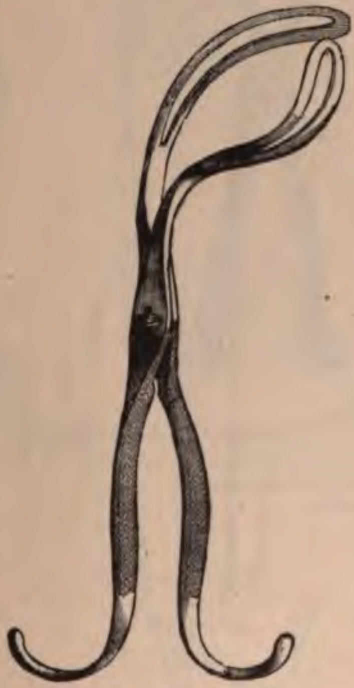


Fig. 55.—
Baumer's Forceps.

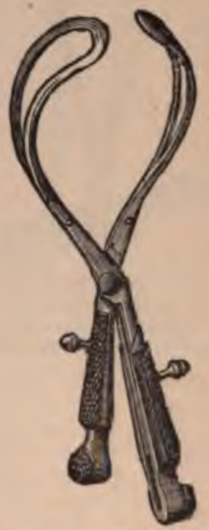


Fig. 56.—
Campbell's Forceps.

Traction-forceps of Joulin.—This instrument is composed of: 1. A steel rod, 13 inches long, in which turns a second rod, as the handle *c* is revolved. 2. A fulcrum, *f*, of metal, and which is applied to the ischiatic tuberosities of the woman. 3. A small dynamometer, which measures

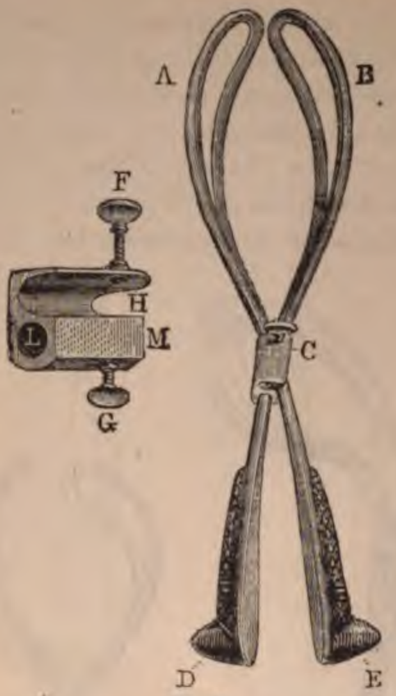


Fig. 57

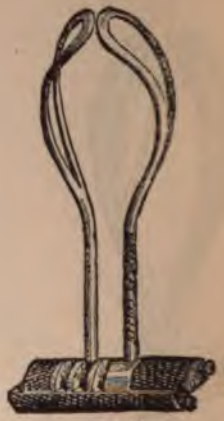


Fig. 58.

Fig. 57.—Mattei's Forceps.—*A*, *B*, Blades. C, Lock of both blades. *D*, *E*, Extremity of blades. M, Lock seen separate. *F*, *G*, Screw for fixing lock apparatus. *H*, Depression for superior blade. *L*, Opening through which inferior blade passes.

Fig. 58.—Leniceps of Mattei.

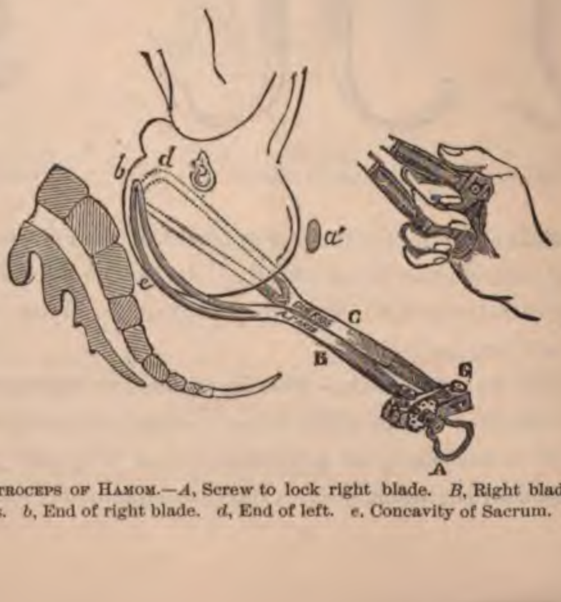


Fig. 59.—Retroceps of Hamom.—*A*, Screw to lock right blade. *B*, Right blade. *C*, Left. *G*, Lock. *a'*, Pubes. *b*, End of right blade. *d*, End of left. *e*. Concavity of Sacrum.

the force applied. 4. Finally, a filet, .19 of an inch in diameter. The instrument is furnished with an écraseur, H, which articulates with the

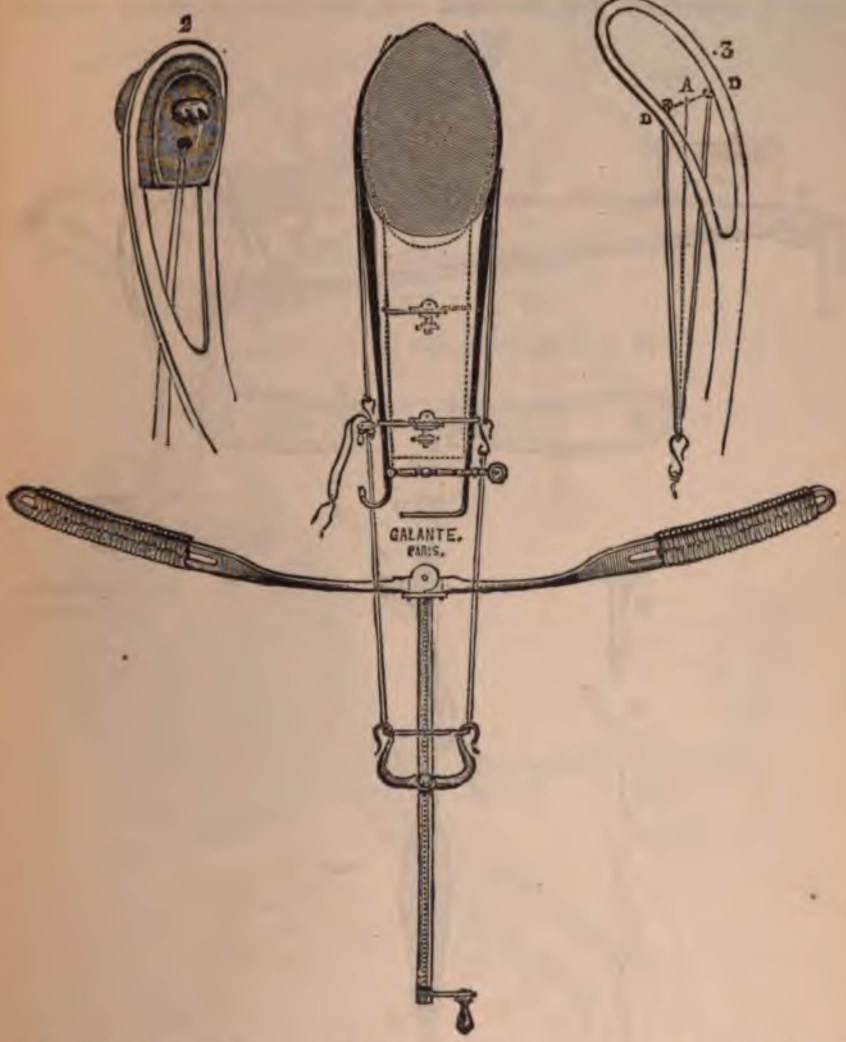


FIG. 60.—CHASSAGNY'S FORCEPS.—1, Complete apparatus. 2, Apparatus with sunken hooks projecting at will, for seizing the head after craniotomy. 3, Method of insertion of the filets on the blades. *DD*, Projections on the blades, for holding the filets.

canula, and may be worked by means of the Chassagny or Maisonneuve chain.

Method of Application.

The forceps, whatever the model, having been applied to the fœtal head, in accordance with the usual rules, the filets are passed through the fenestræ. The metal disk, articulated with the canula, is placed over the ischial tuberosities of the woman. The ends of the filets are

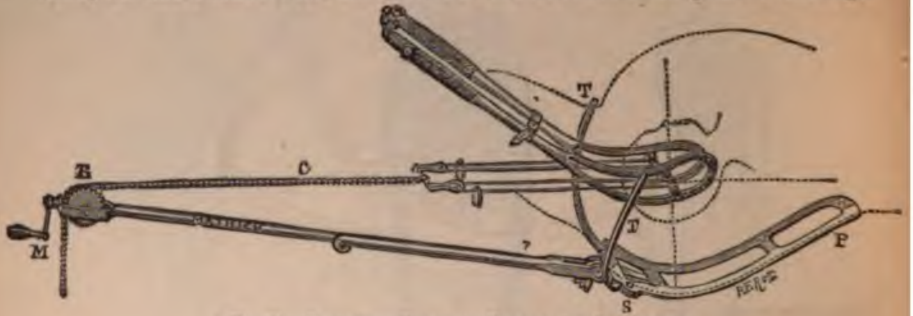


FIG. 61.—SUSTAINED TRACTION FORCEPS OF CHASSAGNY.

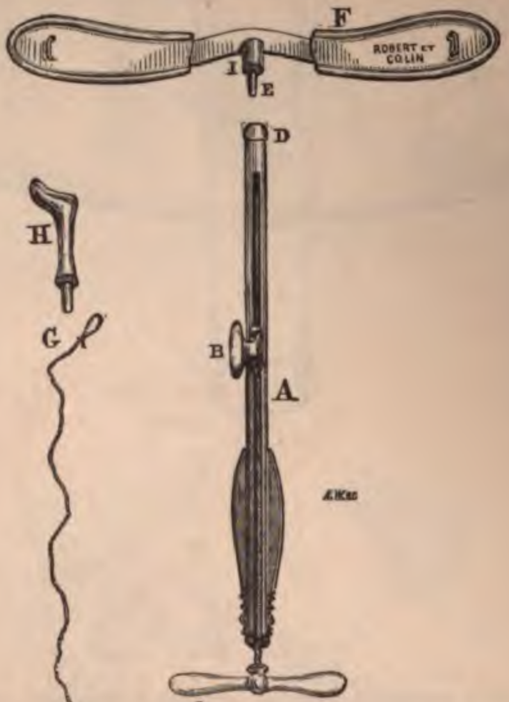


FIG. 62.—TRACTION FORCEPS OF JOULIN.—*A*, Canula. *B*. Screw. C, Handle of second rod. *D*, Extremity joining *E*. *F*, Metal fulcrum. *G*, Filet. *H*, Point of the ecraseur articulating with the canula.

attached to the dynamometer, and this is fixed to B, which moves when the handle, C, of the canula, is turned. The filets act doubly; they not only pull the forceps, but they approach the blades, so that the pressure exerted on the fœtal head is certain, and is measured by the dynamometer. (Fig. 63.) When the head emerges, the tension of the filets becomes lessened. The dynamometer, further, serves to regulate the operation. Whenever the needle tends to swing quickly, the operator should stop for awhile. The duration of the operation is from ten to thirty minutes. The canula must be held horizontally. The first tractions compress the soft parts against which the disk is applied. Trac-

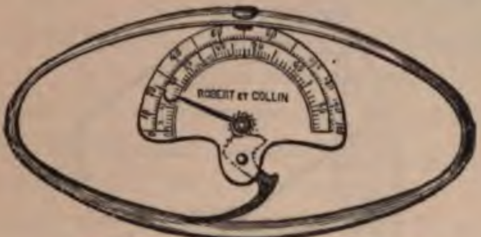


FIG. 63.—DYNAMOMETER OF JOULIN.

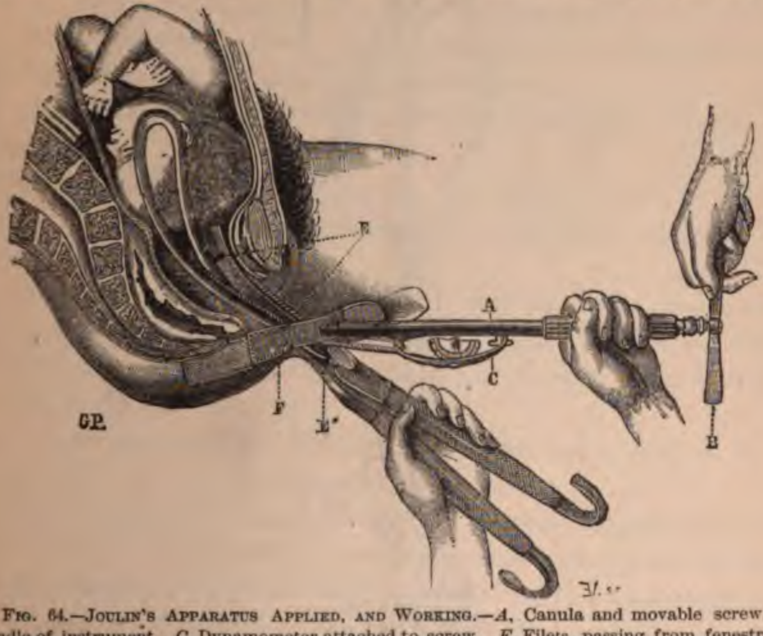


FIG. 64.—JOULIN'S APPARATUS APPLIED, AND WORKING.—*A*, Canula and movable screw. *B*, Handle of instrument. *C*, Dynamometer attached to screw. *E*, Filets, passing from fenestræ to dynamometer. *F*, Metal plate. The filets glide over the lower border.

tion in the pelvic axis is maintained by the point of reflexion of the lower border of the disk, which partially occludes the vulva.

Joulin has proved experimentally that *manual* tractions with the forceps, instead of being regular and continuous, are abrupt and broken at short intervals, the force employed varying from 84 to 132 pounds, while *mechanical* tractions are regularly sustained, and may always be graduated by the dynamometer.

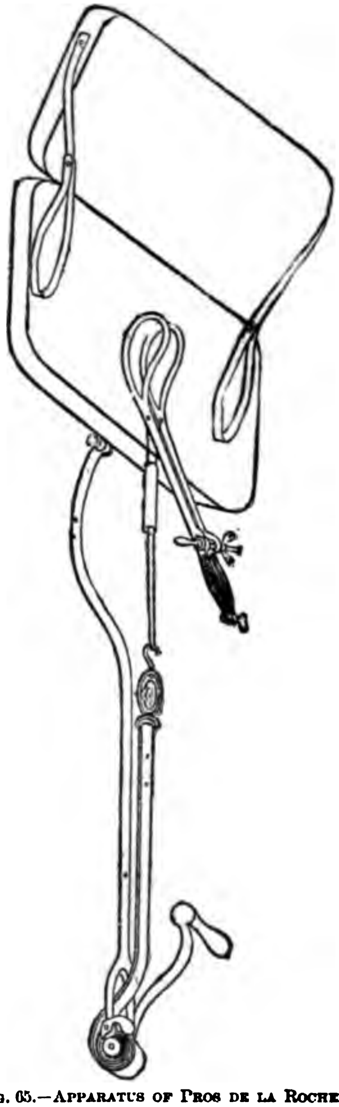


FIG. 65.—APPARATUS OF PROS DE LA ROCHELLE.

Apparatus of Pros de la Rochelle.—Pros is also a partisan of mechanical traction, and uses the following apparatus, (Fig. 65), consisting of:

1. A movable shelf, to be placed on a bed or a table, on which the woman lies, and allowing of different positions. It is 16x7.8x3.9 inches in dimensions.

2. Bracelets, not indispensable, for holding the woman in place.

3. A movable rod, 21 to 26 inches long, articulating with the shelf. Extremely movable, it allows the accoucheur to make traction on the forceps with almost mathematical precision in the axis of the strait, even where the pelvis is oblique or oval. The attached handle has simply to be depressed in a half circle to exert a force of 28 to 31 pounds.

4. A slender forceps, 15.6 inches long, the fenestræ 1.36 inches deep, the curve being like Levret's.

5. A traction bar and a dynamometer.

6. A rounded wooden canula, for receiving the traction rods of the forceps.

7. A transverse rod to the forceps, graduated in hundredths of an inch, to indicate the amount of separation of the blades.

8. An intra-pelvic traction rod, to be used in case of narrowing at the pelvic strait.

9. A belt to be applied around the waist of the woman, to correct uterine obliquity, to control the uterus, and to compress somewhat the fœtus.

Apparatuses of Poullet.—Poullet, of Lyons, has devised two instruments: one, called the *sericeps,* to take the place of the forceps (*see* further on); the other, a *tractor* (Figs. 66, 67), to be used either with the sericeps, or the forceps.

It is composed of three portions: 1. A pelvic arc, *a, b, c, d.* 2. A straight rod, *e, f.* 3. A canula.

The pelvic arc is terminated at each end by a quadrangular loop, covered by rubber, and intended to receive the tuberosities of the ischium. The dimensions of the arc are important. From *a* to *c* 3.5 inches, from *b* to *d* 4 inches. The width of the loops from *a* to *b* and from *c* to *d* is 2.7 inches.

The arc is in two pieces, joining and holding firmly the rod at *e.* The instrument may thus be taken apart, and the arc increased, where the head is large.

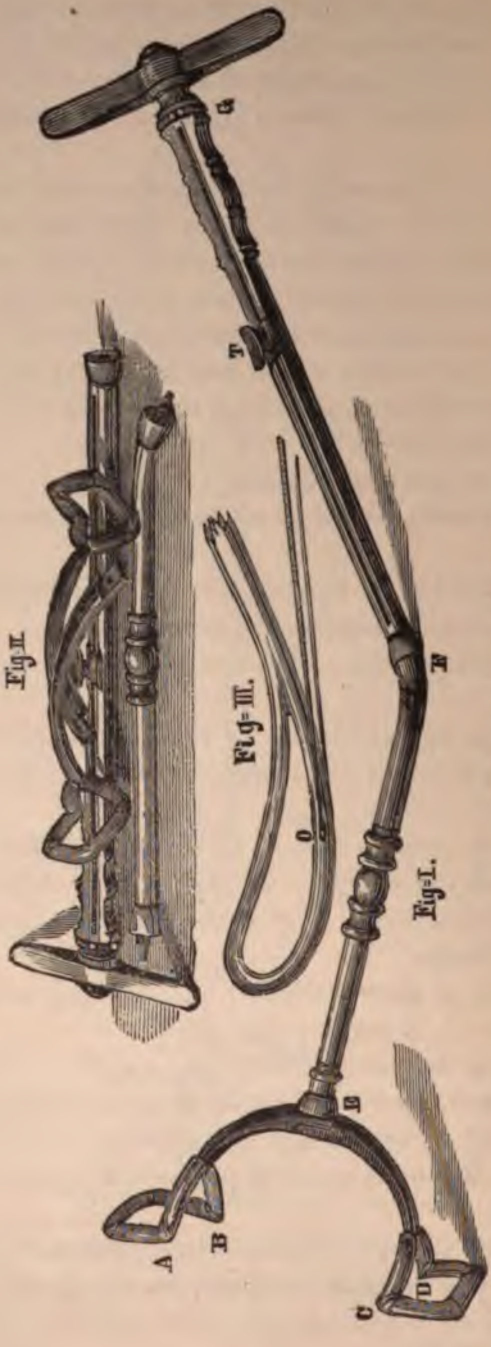


FIG. 66.—NEW TRACTOR OF POULLET.

The rod *ef* is straight to *f*, where it bends forward, making an angle at *f* with the canula *gf* of 140°.

The canula *fg* incloses a rod which is moved by turning the transverse handle, and this rod imparts motion to *t*. It is to *t* that the loops of the rods of the forceps, or the lower sling of the sericeps, are attached. At the beginning of labor *t* is at *f*, at the end of labor *t* is at *g*.

At *o* each blade of the forceps is pierced for the passage of the traction chains, which are thus inserted (and this is important) at the level of the centre of the fœtal head.

This tractor rests on the pelvis, in front, and behind each tuberosity. These four points, *a*, *b*, *c*, *d*, form a quadrangle through which pass the traction cords. The instrument holds the position given it, each turn of the handle simply applying it closer against the pelvis.

The operator may dispense with an assistant, and he may manipulate the instrument with one hand, while the other sustains the perineum. He is further able to alter the axis of the tractor at will; thus, at the beginning of labor, as far back as possible, in the middle of labor, as far forward as possible. The instrument makes, at first, traction backward, perpendicularly about to the inlet, and later tractions forward, perpendicularly to the inferior strait. Figure 67 shows the tractor pulling the forceps, the head at the superior strait. The dotted lines show the position of the instrument at the end of labor.

My colleague, Bailly, has brought forward the following objections against the use of mechanical tractors in labor:

1. These tractors substitute blind force for that of the sentient guiding hand.

2. They act in only one direction, and do not allow us to change the traction line according to the change in the pelvic axis; consequently oblique force is applied to the pelvic walls, which, from mechanical principles, results in loss of direct force.

3. Mechanical tractors interfere with lateral movements of the forceps.

4. They may slip from the head before the accoucheur knows it; and, if a force of 17 to 18 pounds is being exerted, what may not happen to the maternal parts?

5. If manual traction be sufficient to bring down the head through a contracted pelvis, whenever this is at all possible, what scope or necessity is there for mechanical tractions?

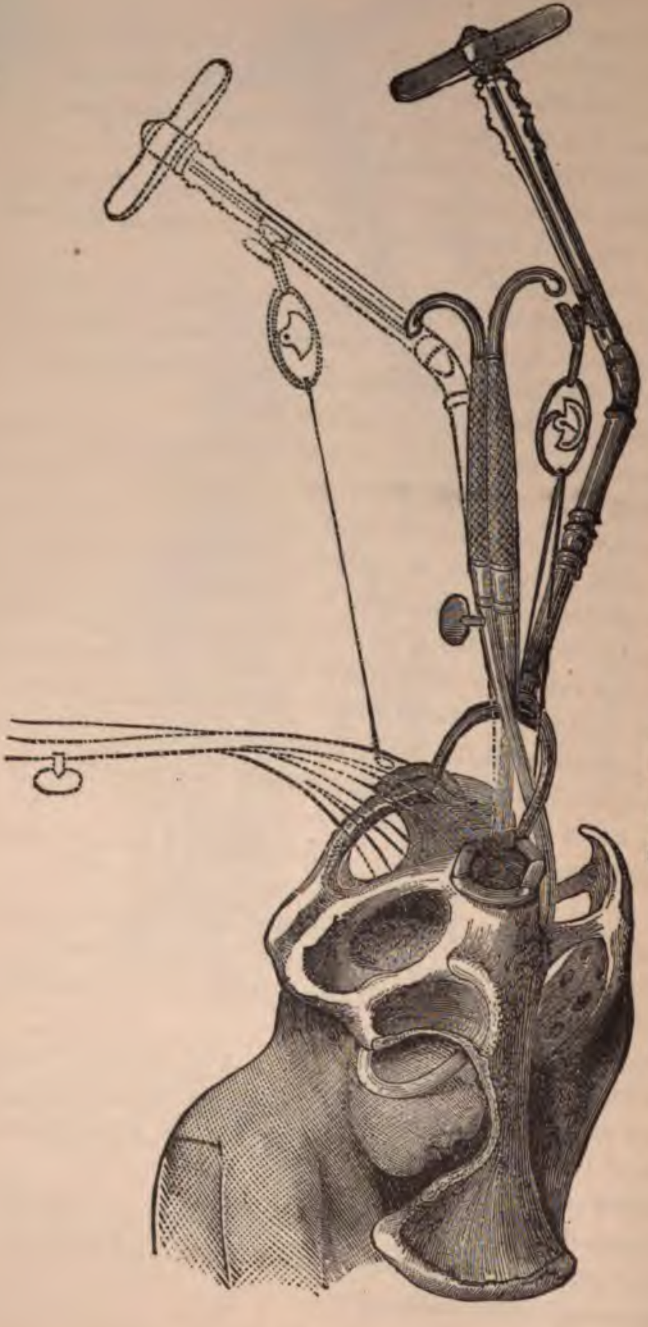


FIG. 67.—NEW TRACTOR OF POULLET, IN ACTION.

6. The time requisite for the introduction of these instruments must add to the maternal suffering.

7. Facts have proved that not only are mechanical tractions dangerous for the mother, but that further the very fœtal lesions which they aim to prevent are more frequent than after the use of the ordinary forceps.

Although the modifications of Pros and of Poullet have negatived certain of the above objections, the others are still valid, and we are in perfect accord with Bailly, Depaul and Pajot, who absolutely reject mechanical tractors. Tarnier is less positive, and he believes that, in the future, all these objections against mechanical tractors will be overcome.

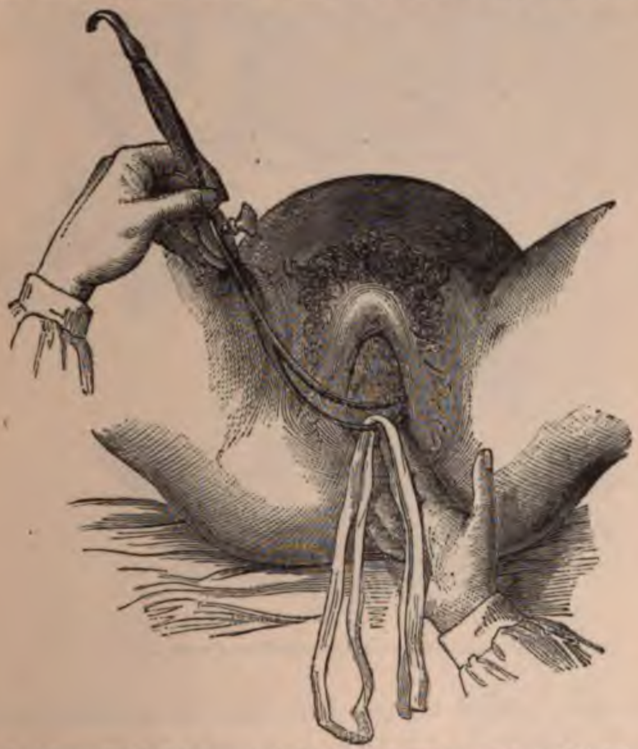


FIG. 68.—INSERTION OF BLADE WITH LOOP FOR CONTINUOUS TRACTION. (After *Tarnier*.)

Starting with the assumption that manual traction varies with the muscular force of each individual, and from moment to moment, he proves that mechanical traction is, on the contrary, progressive, and may furthermore be limited and gauged by means of the dynamometer, and this latter adjunct is indispensable.

The principal objection, in his opinion, resides in the constant action of mechanical tractors. He has endeavored to overcome this as follows: "Through the fenestræ of an ordinary forceps he passes a double sling, the ends of which are tied together externally, and looped over a dynamometer. (*Vide* Figs. 68, 69 and 70.) This dynamometer is connected with a fixed point, a hook in the floor, six feet distant.

"The woman is placed in the usual position, held by assistants, and tractions need only be made on the cord which commands the loops, when the fenestræ are brought together with a force proportionate to the tractions, and the infant's head is firmly held. (Fig. 70.)

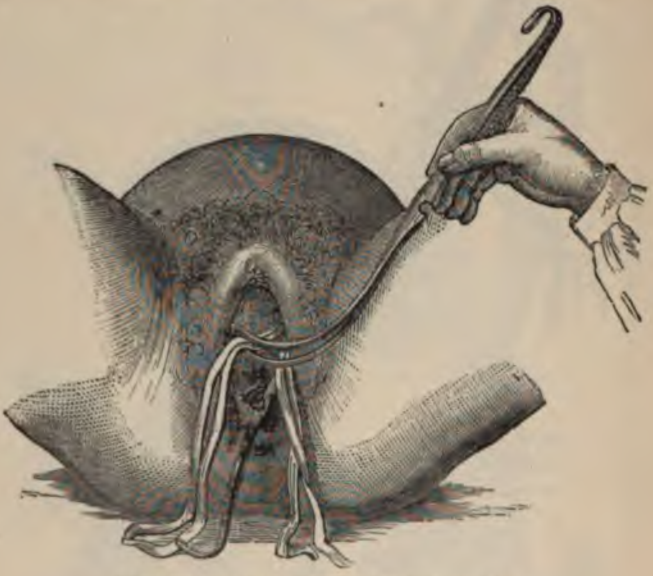


FIG. 69.—INSERTION OF RIGHT BLADE WITH LOOP.

"With one hand the tractions are regulated at will, according to the index of the dynamometer; the other hand guides the handles of the forceps as may be desired, up or down, to the right or to the left. The operation is simple, and the tractions, although mechanical, may be made in any direction as readily as in the purely manual operation."

Lately Tarnier has devised a forceps which we will soon describe. The above method has, in Tarnier's hands, resulted in four dead infants and two mothers out of seven cases.

The movable rod of Pros and of Poullet is another valuable modification echanical tractors, but is not sufficient to overcome our objections, till the head must be seized either in the bi-temporal or bi-parietal eter, and although this is possible in the excavation, it is nearly im-

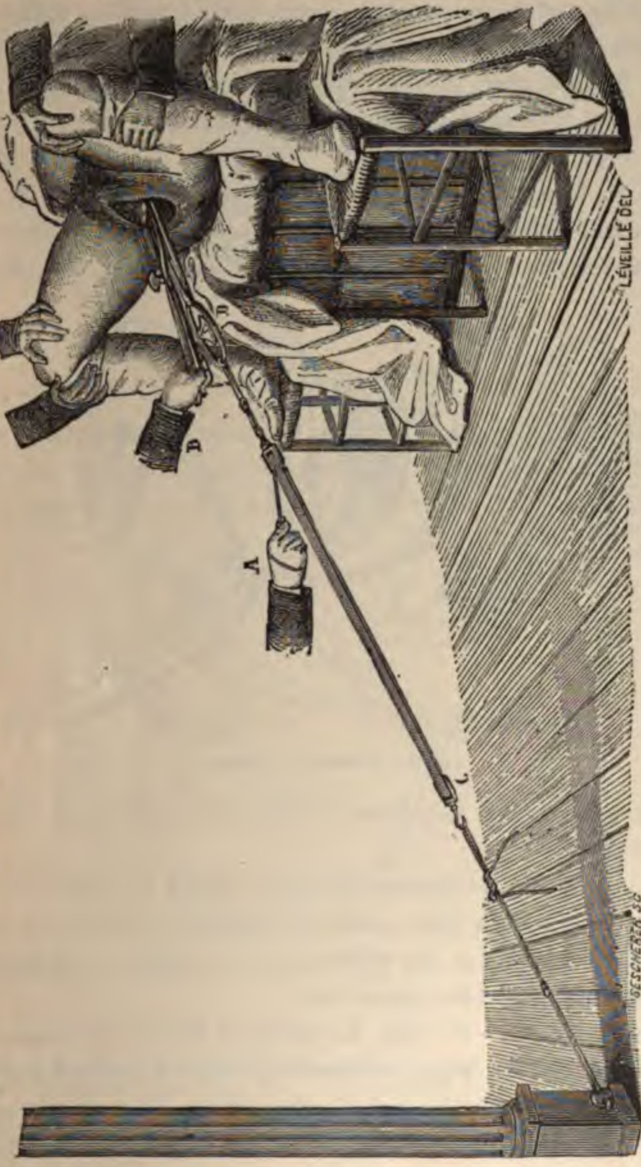


FIG. 70.—*A*, HAND PULLING ON THE CORD WHICH CONTROLS THE LOOPS. *B*, HAND DIRECTING THE FORCEPS. *C*, ONE OF THE PULLEYS OF THE CORD. *D*, DYNAMOMETER.

ble at the superior strait, in particular when there is marked pelvic rmity, and this is, above all, the case in which the advocates of mechanical tractors claim the greatest utility. Further, mechanical tractors do not allow us to take cognizance of rotation movements. For these reasons, chiefly, we are in favor of relegating mechanical tractors to the armamentarium of the veterinary surgeon, never forgetting that the lives entrusted to our care are far more valuable than those of the cow and her calf, with both of whom we may, if we please, in full conscience, experiment with any curious contrivance. With the mother and the child we are never so justified.

Brute force is not what the accoucheur aims at, but intelligent reasoning force; and although I may need only a force of 88 pounds with a mechanical tractor, I would far rather exert one of 135 with my hand, convinced, as I am, that thus there is less likelihood of injury than with 88 used blindly.

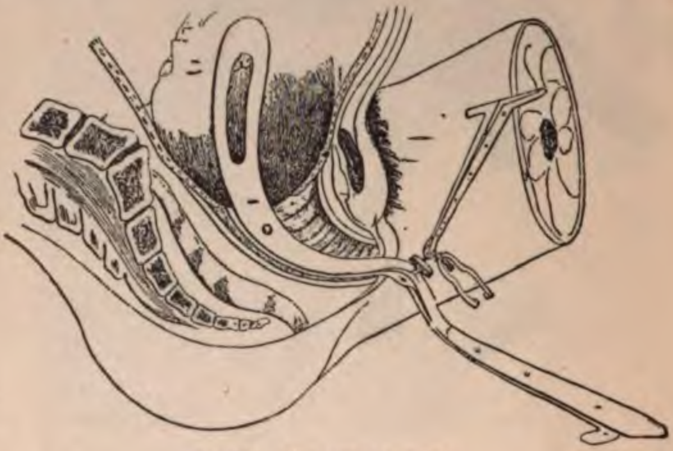


FIG. 71.—HERMANN'S FORCEPS.

While now certain gentlemen have been trying to apply mechanical traction to labor, others have aimed at modifying the forceps so as to make it less dangerous to the perineum, and to allow of traction in the axes of the strait and of the excavation.

Hermann's Forceps.—In 1844, Hermann, of Berne, had constructed a forceps, (Figs. 71, 72), which possessed not only a perineal curve, like that in the forceps of Mulder and of Johnson, but also a considerable pelvic curve, with long blades, and a special rod applicable either above or below the instrument, according to the high or the low situation of the head.

Hubert's Forceps.—In 1860, Hubert de Louvain, struck by the fact that the shape of Levret's forceps prevented traction in the axis of the superior strait, without injury to the perineum, modified them by fixing between the handles a steel rod, directed backwards, and traction by which is possible in the desired direction. (Fig. 73.)

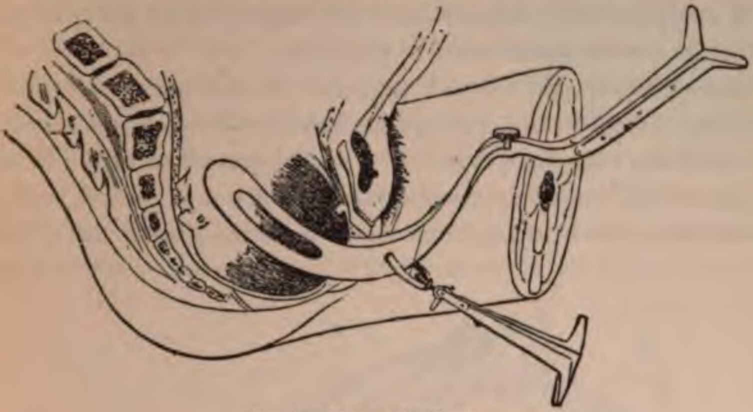


FIG. 72.—HERMANN'S FORCEPS.

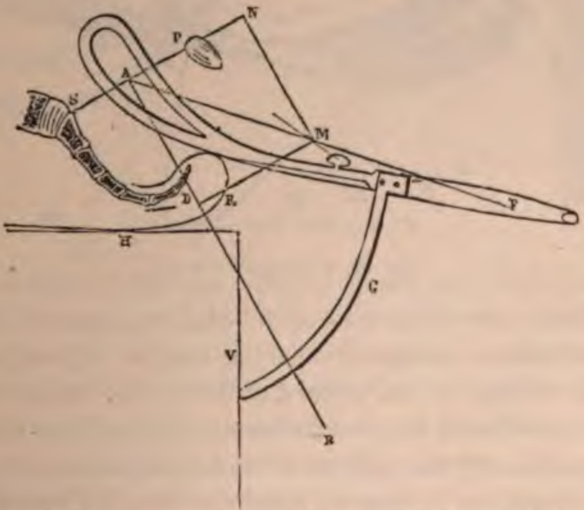


FIG. 73.—HUBERT'S FORCEPS AT THE SUPERIOR STRAIT. *S, P*, Shortest sacro-pubic diameter. *A, B*, Axis of the superior strait. *A, G*, Direction of the traction force applied through the handle of the forceps. *A, D, N, M*, Parallelogram of the forceps. *A*, Centre of supposed fœtal head. *C* Traction rod. *P*, Pubes. *R*, Perineum. *S*, Promontory. *H*, Horizontal Plane. *V*, Vertical plane.

Hartmann's Forceps.—In 1870, Hartmann added to the forceps a rod like that of Hubert, but he placed it above the lock. (Fig. 74.) "If, he says, "the ordinary forceps is applied to the head at the brim, traction will not be made in the axis of the pelvis, but from above downwards, and particularly forwards, and the tendency of the head, hence, is to press against the anterior wall of the pelvis.

"When, however, the rod *ad* is applied, if the operator presses with his arm in the direction *e* to *e*, through the lock, the action on the fœtal head will be, at the same time, from *i* to *i*, and the resultant of the forces is the diagonal *fl*. But since the operator does not press perpendicularly, but obliquely, that is to say, from above backwards, below and in front, about in the direction from *m* to *m*, the head is compressed from *u* to *u*, and the resultant is consequently the diagonal *fr*. If, on the contrary, pressure be applied to the handle *d* of the rod *ad*, from in front backwards, the direction of the pressure becomes *dff*, and the direction of the traction remaining *ff*, the diagonal of the forces *ff* and *ff′* will become *fk*. If now we exaggerate pressure beyond traction, the diagonal will alter from *k* to *k′*, and the head, as it descends, will do so in the axis of the pelvis, and will not press against the anterior pelvic wall."

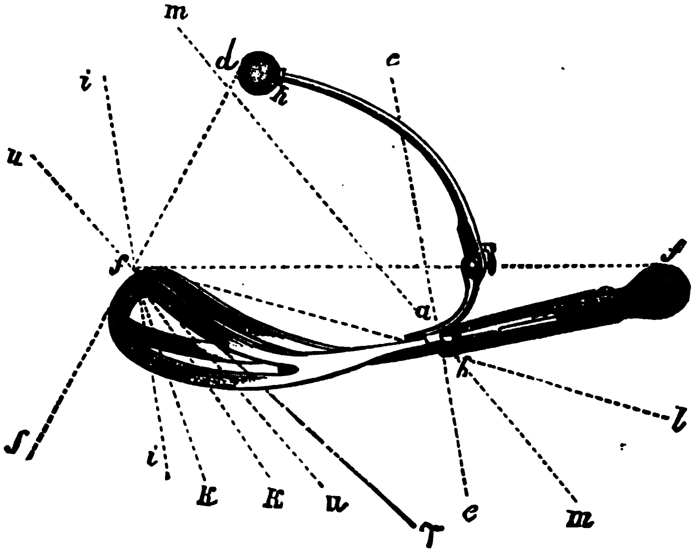


FIG. 74.—HARTMANN'S FORCEPS.

Morales has also devised two forceps, which, although progressive modifications, are open to serious objections.

Finally, Tarnier, from 1877 to 1879, invented over thirty forceps, of which we will describe here only the first and the last model. (Figs. 75 and 76.)

The following are the peculiarities of the first model, that of 1877. "It is composed of two handles, and of two traction rods. (Fig. 75.) The rods are inserted into a transverse bar at *p*, and are parallel as in the forceps of Thenance. The fenestræ are not as long as in the classic forceps; the instrument has a perineal curve, that of Morales modified; the traction rods and the handles are united by a freely movable articulation. To apply this forceps: Articulate each traction rod to its corresponding blade, and this is easily done. Holding both in the hand the fenestra is applied to the head in the usual fashion. When both blades have been introduced, the forceps is locked with the traction rods below. Compression is applied to the head by means of a screw, working from one handle to the other. The traction rods are inserted into the transverse traction bar at *p*. During traction on this bar, the handles act as an index of the direction in which traction should be made, and the operator has only to follow the oscillations of these handles, keeping the traction rods about one-half an inch apart from the handles." (Aubenas.)

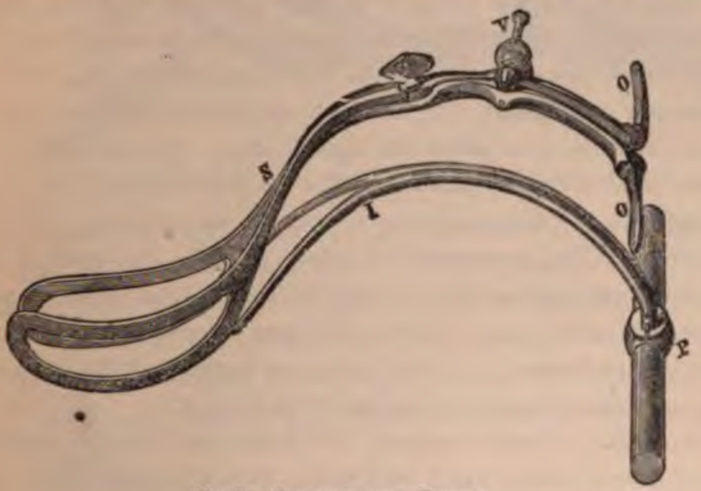


FIG. 75.—TARNIER'S FIRST FORCEPS.

According to Tarnier, the above instrument is preferable to the ordinary: "1. Traction need not be so energetic. The whole of the traction force is utilized. If the head resists with a force of 37 pounds, then only 17 pounds traction force need be exerted by the instrument, while with the ordinary forceps greater force would be requisite on account of the necessary decomposition of this force. 2. With this instrument all the utilized force acts on the head in the pelvic axis without any compression of the maternal parts. 3. Since traction is made in the pelvic axis, the head has no tendency to escape from the fenestræ. 4. The traction handle being transverse, the grasp of the operator's hand is firmer. 5. Compression once made by the screw *r*, this is not increased during traction; while with the ordinary instrument, the hands of the operator make greater compression the greater the traction, and the antero-posterior diameter of the head is thus elongated, and the obstacles to labor increased when the pelvis is narrowed in its antero-posterior diameter. 6. The fenestræ being short, we may always make traction in the pelvic axis without fear of tearing the posterior commissure. 7. Not only may axis-traction be made, but the head is at liberty to follow the vaginal curve. Owing, further, to the movable point at the articulation of the traction rods and the handles, the head may spontaneously execute its rotatory movement around the pelvic axis. When, however, it is desired to make this rotation artificially, then care must be taken to seize the rods and the handles together, for if the endeavor is made to rotate the head by means of the rods alone, they might be broken. 8. Finally the new instrument has an indicator needle, wherein it is peculiar over all other forceps."

While Tarnier's pupils accepted this instrument with the greatest enthusiasm, far otherwise was it with Stoltz, Depaul, and, above all, Pajot. The latter, in his discussion with Tarnier, thus compares the classic and the new instrument: "*Tarnier's Forceps:* A complicated instrument, deprived of all lever property, less easy to introduce and to manage, only able to do what all other forceps may. 2. An instrument still unproved, of value where the head is movable above the superior strait. 3. An instrument with an indicator needle, of no use when the operator knows his business. 4. Fenestræ useful in cases where delivery may be accomplished with dressing-forceps, but useless otherwise on account of their small size. 5. An instrument said to be of value because by it traction may be made in the pelvic axis, a superfluous advantage in 90 cases out of 100, and still to be proved true in the remaining 10. *Classical Forceps:* 1. An instrument, simple, handy, easy of introduction and of management, with two branches instead of four, without screw, successful in

umerable cases, according to need, *tractor, lever, compressor,* accord-
to exercised traction, less likely, hence, to slip in difficult cases, and
en it does slip, at once notifying the operator. 2. An instrument giv-
full scope to the head between the tractions, and more than Tarnier's
trument during the tractions, the head never being elongated antero-
steriorly more than a firm hold necessitates. 3. The masters in the art
sider the principle even of Tarnier's instrument superfluous."

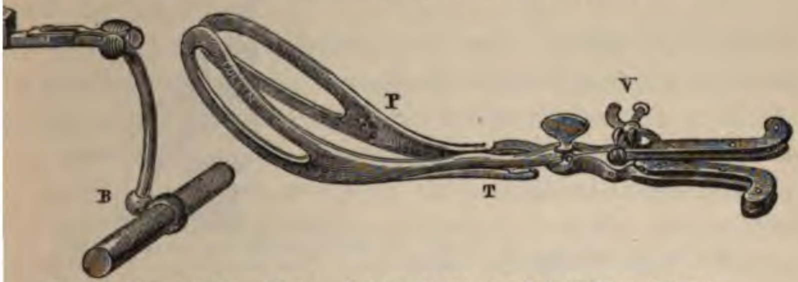


FIG. 76.—TARNIER'S LAST MODEL. *B*, Movable handle. *P, T, V*, Forceps closed.

The last model of Tarnier's instrument differs markedly from the first,
the perineal curve no longer exists, and the fenestræ are similar to
se in the classic forceps. It is, in brief, the classic forceps to which
ction rods are attached. (Figs. 76, 77, 78, 79.)

The following is the description of the instrument: It is 16½ inches long.
en lying flat, the end of the blades projects 3.12 inches above the plane.

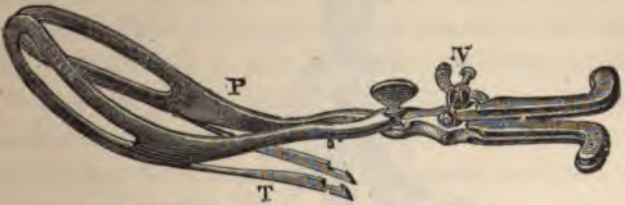


FIG. 77.—TRACTION RODS SEPARATED FROM HANDLES.

e blade and the curve are exactly similar to those of the ordinary for-
s, with the single exception that the fenestræ are not quite as long.
e distance from the end of the fenestræ to the lock is 10½ inches; from
same point to the ends of the traction rods it is 9¾ inches. There
space of ¾ of an inch between the ends of the blades when the instru-
nt is locked. The greatest distance between the blades is 2¾ inches as
the classical forceps. The introduction and use is the same as the

latter, except in the following respects: The compression screw; traction is made by rods, always at about $\frac{3}{4}$ of an inch from the handles; as soon

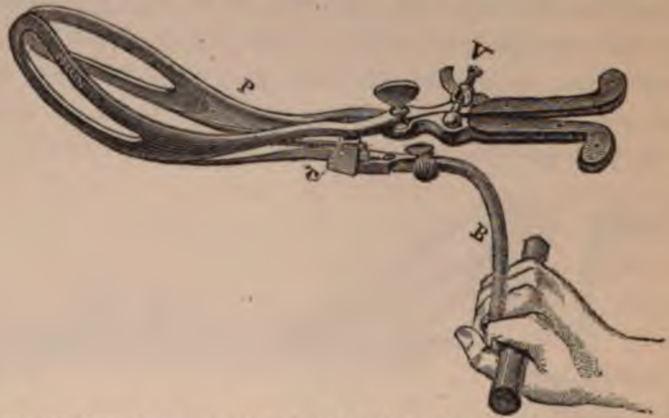


FIG. 78.—MOVABLE HANDLE ADJUSTED, AND HAND HOLDING THE TRANSVERSE BAR.

as the head is about to escape at the vulva both the handles and rods

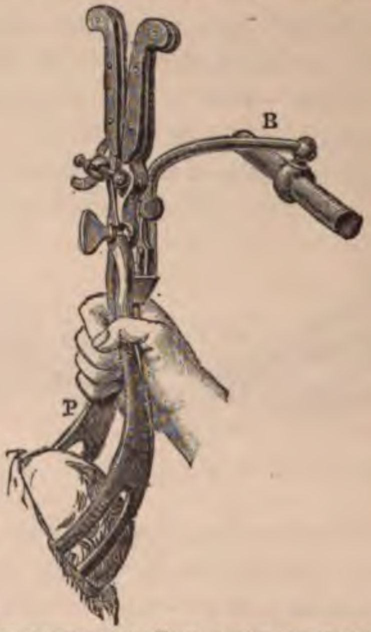


FIG. 79.—FORCEPS SEIZED BY THE HAND, BELOW, AND NEAR THE BLADES.

seized near the blades, to prevent too rapid exit of the head. (*Vide* Fig. 79.)

Thus modified, Tarnier's instrument is an excellent one, for to the classic rceps he has added, in our opinion, two improvements, *in the pelvic cavation,* certainly. The indicator needle, by showing the direction in hich traction should be made, is of great utility, and less force has to employed in traction than with the classic forceps. The same is not ne at *the superior strait,* for the last model lacking the perineal curve, ere is the same difficulty with Tarnier's instrument as with the classic carrying it sufficiently backwards, and the force to be used is identical both instances.

The objections to the instrument are, in our opinion, still numerous: A two-fold manipulation is requisite, the one for articulation of the han- es even as in the classic forceps, the other for the insertion of the trac- n rods. In order that these rods may functionate properly, they must absolutely parallel—that is to say, the head must be seized symmetri- lly, and this, while easy enough in the cavity or at the inferior strait, difficult, if not impossible, at or above the superior strait. Further, en the head is high up, the lock is at the vulva, and the traction rods, ing shorter than the handles, must, necessarily, be adapted within the lva. This objection, however, is not insurmountable, and may readily rectified. Tarnier's figures, as Pajot points out, represent the forceps plied to the head already engaged, and not above the superior strait, ich is what Tarnier aims at. It is evident that the difficulty of appli- tion is far greater above than at or within the superior strait. 2. The strument is, above all, intended to pull in the mathematical axis of the lvis, and yet, as Pajot points out, it is not possible to limit this mathe- tical axis, for it differs in each pelvis, and, according to Dubois and egelé, "there are gentlemen who have endeavored to be mathemati- lly exact in their researches, and who, to attain their end, have invoked e aid of geometry for the settlement of scientific questions, when this l is not only *useless,* but really *superfluous.*" Tarnier himself has not etended to make traction with his instrument in the exact mathematical lvic axis, for he says, "it will doubtless be said that the expert accou- eur knows how to give to the forceps a direction which gives to the head movement in exact accord with the pelvic curvature. In order that is may be true, while making traction the handle should follow a line actly like that represented by the letters f, m, n, f'. (Fig. 80.) Even ough they have as a guide only *uncertain anatomical rules, since the ape of the female pelvis is ever variable,* a skilled artist would have trouble in exactly reproducing this line. How then can an accoucheur be expected to follow it, especially when, at the same time, he must make the traction?"

The above objection, stated by Tarnier himself, applies perfectly to his forceps. How, says Pajot, can Tarnier make traction in an axis which is unknown to him?

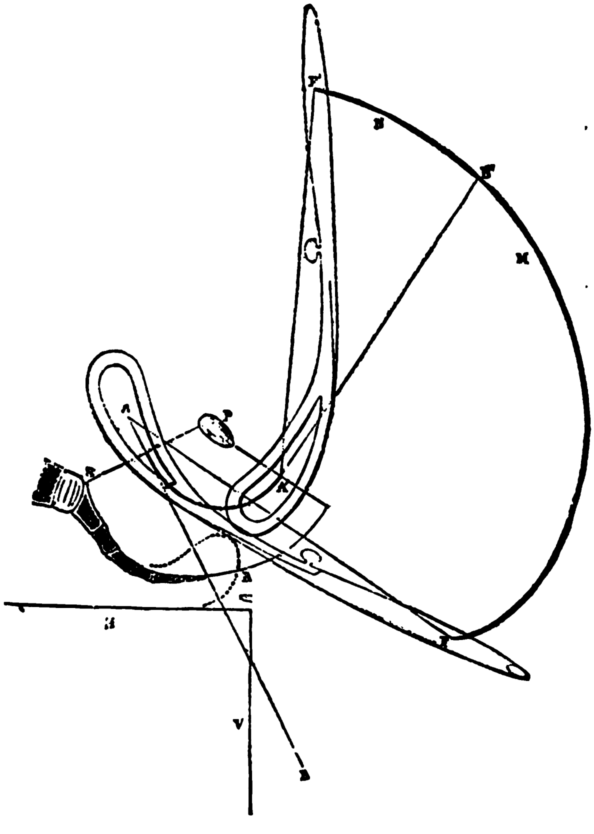


FIG. 80. EXTERNAL CURVE TRAVERSED BY THE FORCEPS WHEN THE HEAD FOLLOWS EXACTLY THE PELVIC CURVE. *S*, *P*, Least sacro-pubic diameter. *A*, *B*, Axis of superior strait. A', B', Axis of the vulvar orifice. *A*, *F*, Traction line with forceps above the superior strait. *A'*, *F'*, Traction line with head at vulva. F, M, N, F', External curve described by the forceps. *A*, Centre of supposed head, at superior strait. *A'*, Centre of supposed head at vulva. *P*, Pubes. *R*, Undistended perineum. *R'*, Perineum distended. *S*, Promontory. *H*, Vertical plane of border of bed.

2. With Tarnier's forceps, before making traction, the precaution must be taken to turn the compression screw in order to fix the head. As stronger traction is made, the head is compressed by the walls of the canal

rough which it is passing, and the head, therefore, tends to become aller, of necessity; then the screw must from time to time be tightened.

3. The greatest objection we have to Tarnier's instrument is the follow- g: With the classic forceps, the accoucheur is at all times conscious of e progress made by the fœtal head; with Tarnier's, however, he is not all. When the head resists, greater traction is made. If it descends, the better, if it does not we pull harder still; thus nothing indicates e limit. Traction, therefore, may readily be exaggerated, and serious mage be done.

4. Although Tarnier s forceps is just as firm in hold as the classic, it is vertheless the compression screw alone which retains the handles in appo- ion. The head may be seized incompletely with this instrument, even with the classic, and consequently it is just as likely to slip. This has ppened to us twice, and to Budin once. Now with the classic forceps ld in the hand, we know at once when it is slipping, and this may be evented. Not so with Tarnier's forceps. The hand pulls on the trans- se bar of the traction rods, and is no longer conscious of slipping of instrument from the head, which may result in vaginal and vulvar ions, not to speak of uterine, the greater the stronger the exerted trac- n.

5. When Tarnier's forceps is applied at or above the superior strait, ce the perineal curve is absent, the disadvantages are as great as in the ssic forceps.

6. The indicator needle is at times faulty, as happened to us twice, in es of delivery at the superior strait. Here the indicator approached vulva, but although we followed it in our traction, we could not budge head, and were obliged finally to resort to the classic forceps, and ex- cted the head at the first attempt. The same thing happened to Porak the Clinic, in a case of persistent occiput posterior.

7. In posterior positions rotation occurs less readily than with the clas- forceps. Both the handles and the rods must be seized together if we h to rotate artificially.

Such are the objections we make to Tarnier's forceps. Let us add, fur- r, that, notwithstanding the assertion of its greatest advocates, it does langer the integrity of the perineum as much as the classic forceps. have seen an instance where the instrument was being used by one Tarnier's most distinguished pupils. It is evident, indeed, that we are less enthusiastic in regard to Tarnier's instrument than his pupils, *but we still recognize its utility in the cavity.* Once the head has passed the superior strait, it is an excellent instrument, possessing over the classic forceps the superior advantages of having an indicator needle, and of requiring less traction force. *At the level of the superior strait,* when the head is largely engaged, it may also be of great use. But when the head *is but little engaged at the superior strait* or entirely above, we prefer the classic forceps. We have far more confidence in ourselves, we fear less the danger of slipping and the risks implied, for we know at once when the blades are beginning to slip.

We believe, hence, that we ought not to give up, as entirely as the younger French practitioners would have us, the classic forceps which has perfectly done its duty. The accoucheur will do well to have both in his obstetric bags. Indeed *Tarnier's last model being simply the classic forceps with attachable traction rods,* it might be used indifferently. [This is what has been aimed at recently by Wells, of New York, who devised a traction rod which is applicable to the Eliot forceps. We have personally never tried Wells' device, but in appearance it would seem to possess the properties of the Tarnier instrument, and we have been informed that it has practically fulfilled its purpose, that of an axis-tractor.

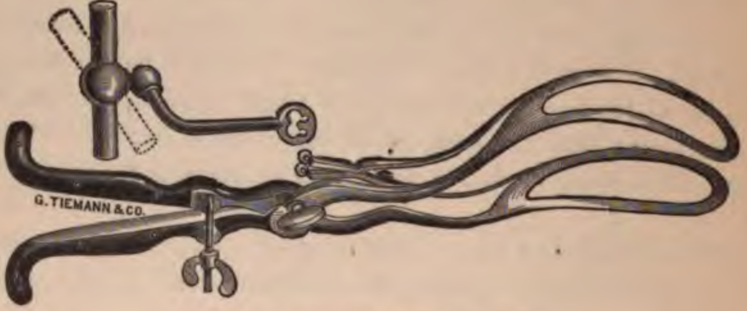


FIG. 81.—LUSK'S AXIS TRACTION FORCEPS.

Lusk, of New York, has modified Tarnier's original model, by having the blades made lighter, and shaping them somewhat like Wallace's instrument. He has thus made the application of the blades in contracted pelves a simpler matter. He has also improved the manner of adjustment of the traction rods to the traction bar.—Ed.]

THE INDICATIONS FOR THE FORCEPS.

The forceps being an instrument intended to be applied to the fœtal head, and for the extraction of the fœtus from the mother, will be indicated whenever, the head presenting and the *sine qua non* conditions for its application existing, any danger menaces the life of the mother or of the child during labor.

We have already seen that the instrument may also be used in case of pelvic presentations, and the sphere of applicability of the instrument is thus widened.

The forceps thus is indicated:

1. Whenever, in head presentations, normal labor becomes difficult or impossible, owing to feebleness or absence of expulsory pains.

2. Whenever there exists disproportion between the size of the fœtus and the dimensions of the pelvis, whether this disproportion depends on excess in fœtal size, contraction of the pelvis, prolapse of a fœtal part, extended vertex presentations, face presentations, or on resistance of the soft parts.

3. Whenever an accident supervenes compromising the life of the mother or of the child, such as hemorrhage, syncope, eclampsia, herniæ, retention of urine not to be relieved by the catheter, rupture of the uterus or of the vagina, short funis, absence of rotation, etc.—in a word, in every instance of dystocia, where, the head presenting, the termination of labor is called for in the interest of the mother or of the child.

4. Occasionally in pelvic presentations.

Of the above indications there are three, in particular, which most frequently necessitate resort to the forceps:

a. Resistance of the perineum, and the inertia uteri which is a consequence.

b. Persistent occiput posterior presentations.

c. The arrest of the head above, or at the level of the superior strait, by a contraction of the pelvis.

Of these three, the two first are the most frequent, particularly in primiparæ. Where the forceps is called for in case of the urgent complications of labor, such as hemorrhage, the indication is often urgent, instantaneous so to speak. Not so, however, in case of the two indications we have just noted. Here we must, on the one hand, avoid *too quick action*, and, on the other, *too tardy*.

a. *Resistance of the Perineum.*—Our practice is entirely in accord with that of our teachers Pajot and Depaul. When the head reaches the perineum, if, at the end of an hour and a half to two hours, it makes no progress, we terminate labor by applying the forceps, no matter what the intensity of the contractions. Usually, however, in these instances, contractions are absent or inefficient, so that we are in face of a two-fold indication for the forceps, resistance of the perineum and insufficient pains. To act sooner seems to us useless, for frequently, within this interval, weak contractions become intensified, and the head is quickly expelled. To act later seems to us reprehensible, for arrest of the head means compression of the maternal soft parts, and there may result gangrene, the consequences of which, aside from sepsis, will be fistulæ, rectal or vesical, etc.

b. *Absence of Rotation.*—We give Nature here also a chance, but if within two hours the head does not rotate, we interfere at once by causing artificial rotation. In case of face presentation, we act a little sooner, in order to prevent deep engagement of the chin, which would complicate matters.

It goes without saying, that in these cases, particularly, the fœtal heart should be listened for from time to time, in order that we may interfere sooner still, if the life of the child appears endangered.

c. *Contraction of the Pelvis.*—Here we never hurry. Labor is always longer. Before the head can pass the superior strait it must become moulded, and for this process time is requisite, relatively long. Without referring again to the degree of contraction calling for interference, (*vide* Deformities of the Pelvis, Vol. III.), it is above all the state of the mother and of the child which should be our guide.

As for the other indications, the time for interference varies, of course, according to the complication threatening the mother and the infant, and it is impossible to fix the limit. Finally we must not forget that the forceps is not the only means of terminating labor, and that frequently we may chose between forceps and version.

CONDITIONS REQUISITE FOR THE APPLICATION OF THE FORCEPS.

These are four in number:

1. The os must be dilated or dilatable.
2. The membranes must have ruptured.

3. The forceps should be applied only to the head.

4. The pelvis must not be too contracted.

These four fundamental conditions seem to exclude the application of e forceps to the pelvic extremity. We believe, however, that the dangers so doing have been very much exaggerated, and in a case of breech esentation, where the hand could not reach the feet, we would follow e example of Depaul, Dubois, Stoltz and Tarnier, and apply the for- ps. We cannot sum up this question better than in the words of Tar- er: "The reasons given by those who reject forceps to the breech, seem first sight excellent. In fact the blades do fit badly over the nates, d are very likely to slip; further the pelvic bones are too slight to stand adily the compression necessary for solid hold, and the blades, by pres- re on the abdomen, may tear the viscera. But what are we to do in a se of pelvic presentation, when it is urgently necessary to end labor omptly, and the hand does not suffice? Shall we use the blunt hook? ut this has its disadvantages; and so, in such cases, Stoltz and Dubois ve used the forceps and extracted living children." Tarnier has him- lf done so successfully in a number of cases, and, under the head of *resentation of the Pelvic Extremity*, we saw that this method had suc- eded with a number of German and English accoucheurs.

5. Finally Pajot, without making of it an indispensable condition, men- ns engagement and fixation of the head at the superior strait as a very vorable circumstance.

1. *The Os must be Dilated or Dilatable.*—This is the prime indispensable ndition for the application of the forceps, and we have already dwelt fficiently at length on the meaning of dilatation and dilatability. It is ually when the head is retained at the superior strait that the cervix is atable rather than dilated. We must recognize this dilatability, there- re, and in urgent cases act without waiting for dilatation. If the cervix rigid, and delivery is imperative, we must, without hesitation, knick e external os in several places, which will suffice to make the cervix pple enough to not only allow the introduction of an instrument, but o its removal increased in size by the contained fœtal head.

If nothing urgent calls for the termination of labor, we ought to wait long as the state of the mother and the child will allow. This is an solute rule, unfortunately for the mother and the fœtus too often in- nged. One of the qualities which we as medical men should possess, is the ability to resist the entreaties of friends and the patient, particularly a primipara—*to know how to wait, and do nothing.* How many labors would have ended happily, and yet have terminated in the death of the mother and the child, because inexperienced or hurried physicians have used the forceps prematurely, and thus compromised through ignorance the issue of labor! How many unfortunate women die, as the result of dangerous premature use of the forceps, which not only does not allow the termination of labor, but produces grave lesions of the vagina or the cervix! It is particularly in primiparæ that we note these effects, so that we cannot emphasize enough the fact that *every application of the forceps, where the cervix is neither dilated nor dilatable, is not only useless, but is also dangerous.*

We should never forget that, in primiparæ, dilatation of the cervix takes place always slowly, especially when the membranes have ruptured prematurely; that it is not exceptional, in such cases, for dilatation, even where the head is deeply engaged, to require from fifteen to twenty-four hours, and that application of the forceps before dilatation is completed will not only prove an exceedingly difficult and delicate operation, but possibly dangerous. It is only exceptionally that we are called upon to interfere before dilatation is completed, and where only, in case of absolute necessity, is it allowable to knick the external os. *Aside from absolute necessity, the rule is absolute, wait for dilatation, and only interfere when the condition of mother or of child calls for it.*

2. *The Membranes must have Ruptured.*—This condition is as indispensable as the preceding; for if we should apply the forceps before rupture, we might separate the placenta, and have more or less serious hemorrhage.

3. *The Forceps should only be applied to the Head.*—This condition, we have seen, is too absolute, for we are fortunate at times, in pelvic presentations, to be able to extract the fœtus by it. It is otherwise exact.

The instrument may be applied either to the before-coming or to the after-coming head; or again to the head left behind in the uterus after decapitation. (We will consider this later.)

4. *The Pelvis must not be too contracted.*—(*Vide* under head of contracted pelvis, comparison between forceps and version.)

5. Finally, we have seen that Pajot considers it a favorable condition that the head is engaged and fixed at the superior strait.

Up to the time of Smellie, all authorities agreed in preferring version with the head above the brim; as for instance, Levret, Mme. Lachapelle, Baudelocque. Depaul, Cazeaux and Tarnier, without entirely rejecting the forceps, reserve it for cases where the pelvis is deformed. Abroad version is preferred.

In these instances, indeed, the application of the forceps is very difficult. Aside from the mobility of the head, it is rarely seized regularly and symmetrically; the instrument can only rarely be directed sufficiently backwards to engage the head readily; it further slips easily, and we may thus injure deeply the cervix and the vagina. It is, therefore, to version that we ought to resort above the superior strait. But if the uterus, on account of the escape of the liquor amnii, has contracted on the fœtus, then version is impossible, and, before resorting to embryotomy, it is our duty to try the forceps.

The same holds true of relatively marked contraction of the pelvis. If the child is alive we should try the forceps, but we must never use overmuch traction-force. The accoucheur alone should make it, in order that the woman may not be so injured that complications result which may threaten, if not end, her life.

When, on the contrary, the head is engaged, and more or less fixed at the pelvic brim, the forceps only is indicated. The head being immovable, the blades are more readily applied. The lock must often lie in the vagina, otherwise the head will be imperfectly seized, the instrument may slip, and produce damage which we will speak of later.

PRELIMINARY PRECAUTIONS.

Without going as far as Baudelocque and Mme. Lachapelle, who advised showing the woman the forceps and explaining its method of action before application, we believe that it is of advantage to prepare her for it, by making her understand the necessity of terminating labor in her interest as well as in that of the child, by calming her fear of pain, by appealing, in a word, to her heart and her reason. The aid of both friends and relatives should also be invoked, and it is exceptional then that we cannot triumph over her instinctive repugnance, which varies, indeed, with the woman, for many from previous personal experience, or from what they have heard from their friends, call loudly for the instrument. Chloroform is of great assistance, of course.

[We are decidedly opposed to saying anything to the woman about instrumental interference. The friends, of course, should be informed, but as for the woman herself, the mere thought of instruments will often alarm her, so that when we come to the administration of the anæsthetic this is the more difficult owing to the nervous fears of the patient. Seeing that only exceptionally ought we to apply the forceps without anæsthetizing, any pretext may be found for the latter, even if the woman does not call for it herself, and she usually does, and when once under the influence of the anæsthetic we may place the woman in the proper position, and only then produce our forceps.—Ed.]

As for chloroform, although we need not use it where the forceps are applied at the inferior strait or at the vulva, that is to say in the simple cases, we believe it to our interest to resort to it whenever the head is high up, or we anticipate any trouble. We should always call to our aid a professional friend or trained assistant, and this may frighten the woman, still we ought not to dispense, on this account, with one of the things which make anæsthesia safe. The anæsthesia should be deep, to the surgical degree.

Even as in case of version, everything which might be needed should be ready; bath for the infant, laryngeal tube, etc. The bed should be high, resisting, and the instruments within reach of the accoucheur.

Position of the Patient.—If the head is at the vulva, or at the inferior strait, the woman may lie in her bed, pulled to the edge, each leg resting on a chair, and flexed by an assistant. But if the head is high up, or we expect trouble, the obstetrical position should be assumed. In England, the woman is placed in the lateral decubitus when the straight and short forceps is used, the dorsal decubitus being reserved for high forceps. We much prefer, in every instance, the dorsal decubitus.

Before introducing the instrument, we must warm it, and grease it on the convex surface so that it may slide well, and we should always, whenever possible, assure ourselves of the exact position of the head—in a word, complete our diagnosis.

The operative manual is in three stages: 1. *Introduction of the blades.* 2. *Locking of the blades.* 3. *Extraction of the fœtus;* and special rules are applicable to each stage.

General Rules.

Cazeaux has enumerated these with a master hand, and we follow him in his description; but, as we will see, they are not all of equal importance.

1. *The Instrument should only be applied to the fœtal Head.*—This rule is too absolute, for although the forceps is constructed to seize the fœtal head, we have seen that in breech presentations, Dubois, Depaul, Tarnier, Stoltz, and a number of foreign accoucheurs, have employed the instrument with success in a number of instances. We would make, then, the following general rule: *the forceps should only be applied to the head,* whether flexed or extended, before-coming or after-coming, or left in the uterus after decapitation. *Exceptionally, it may be applied to the breech,* when it is to the interest of mother or of child to end labor, and this cannot be done by the hand alone.

2. *The Blades should be applied as nearly as possible to the Sides of the Head, with the Concavities of the Borders directed towards the Point of the Head which we wish to bring under the Symphysis.*—This may be called the French, in contradistinction to the foreign method, and we must explain here what is meant by *direct* and *oblique* application of the forceps. When the head is in the occipito-pubic, or occipito-sacral position, and it is seized in its bi-parietal diameter, since this diameter corresponds to the transverse of the pelvis, the forceps is applied at once *symmetrically* to the head and to the pelvis—that is to say, the lesser curve of the instrument is under the pubic arch, at the anterior extremity of the antero-posterior diameter of the pelvis, and the greater curve is in the concavity of the sacrum, at the posterior extremity of the same diameter; he convexity of the blades corresponds to the extremity of the transverse diameter of the pelvis, the concavity seizes the head at its bi-parietal diameter. The forceps is both parallel to the head and to the pelvis; *the application is direct.*

But the position of the head may be oblique or transverse, and then *the application of the forceps is oblique.* If the instrument is applied parallel o the head, *it is oblique to the pelvis;* if it is parallel to the pelvis, the head cannot be seized in its bi-parietal diameter, and *the application is blique to the head.* Hence, then, the French and the foreign methods. While in France we always aim to grasp the head in the bi-parietal diamter, in England, and above all in Germany, the blades are always inserted parallel to the pelvis. In the oblique presentation of the head, whether first, second, third or fourth positions, it is always possible to seize the head in the bi-parietal diameter. The forceps once locked, then, they will be oblique to the pelvic walls, and will cross the vulva obliquely, the lesser curve not towards the symphysis, but to the right or left, according to the case. The same holds for face presentations.

In transverse presentations it is no longer possible to seize the head in the bi-parietal diameter. The head lying in the transverse diameter of the pelvis, if we endeavor to apply the forceps in the bi-parietal diameter, one of the blades would lie against the sacral curve and the sacro-vertebral angle, the other against the symphysis, and this is practically impossible, whether with the classic or with Tarnier's forceps. To attain this aim, Uytterhoeven and Baumers gave to their forceps a peculiar curve.

On the other hand, if we endeavor to apply the forceps symmetrically to the pelvis, one blade, in case of vertex presentations, is applied over the forehead, and the other over the occiput; in case of face presentation, one over the chin or the face, the other over the occiput, that is to say, not to mention the possible lesions on the face, in the last instance particularly, the head is seized in its greatest diameters, and extraction will be all the more difficult.

Hence, in France, we have recourse to another method: *The application is made obliquely both to the head and to the pelvis*—that is to say, without seeking to seize the head exactly in the bi-parietal diameter, the instrument is applied in such a manner, that the blades are in a diameter intermediate between the bi-parietal and occipito-frontal in vertex presentations, between the bi-parietal and the fronto-mental in face presentations. In a word, the head is grasped obliquely posterior to the parietal region of one side, and to the frontal of the opposite side. The head is thus seized obliquely, both to it and to the pelvis, in an irregular manner, but we believe this preferable to the German fashion; for although the diameter in which we grasp the head is not the shortest, it is at least not as long as the occipito-frontal or the occipito-mental.

Finally, when the head is at the superior strait, we can only exceptionally grasp it in the bi-parietal diameter, but must in an oblique.

The accoucheur has exact information in regard to the way in which the head has been grasped. When it has been seized symmetrically, the blades, when the instrument is locked, are but little separated at the level of the handles, but are notably so when the head has been grasped irregularly or asymmetrically. Then we must be all the more on the watch against slipping.

In many cases, however, we admit that it is impossible, notwithstanding every attempt, to grasp the head symmetrically; and, as it were of themselves, the blades are applied in the intermediate diameter, for it is here there is the most room.

3. *The posterior Blade should usually be inserted first.*—Where it is resistance of the perineum which calls for interference, the occiput is usually to the pubes; where the head has rotated backwards, we may apply the forceps directly, although usually the application must be oblique. One of the most frequent calls for interference is absence of rotation, the head being often transverse, but usually oblique, since these positions, as we have seen, are the fundamental, the others being simply varieties or consequences. One side of the head, hence, is in front, and the other is behind, and in order that the head may be grasped symmetrically at the sides, one blade must be directed backward, and remain posterior when the instrument is locked; the other must be directed anteriorly and remain there. The posterior blade is ordinarily introduced first, and placed at the posterior extremity of the bi-parietal diameter. This rule, however, is not at all absolute; there are many exceptions, and, as Cazeaux well says, "it is habit and discernment of the accoucheur which guide him at the bedside in the insertion of the one or the other blade first."

4. *The male or left Blade is always held in the left Hand, and is always applied to the left Side of the Pelvis.* (Fig. 82.) *The female or right Blade is always held in the right Hand, and is always applied to the right Side of the Pelvis.* (Fig. 83.)—This is about the only rule without an exception. The forceps, indeed, is so constructed that it ought not and cannot be applied otherwise. But the rule is not so absolute in regard to the hand which ought to hold the blades. Hatin, indeed, has proposed introducing both blades with the same hand. "One hand is introduced, by preference the left, up to the fundus, or at least as far as the fenestræ must penetrate. The first blade having been passed along this guiding hand, this, without being removed, is simply turned to the opposite side of the fœtal head, in order to receive and guide the second blade." This method, which should be reserved for very exceptional cases, is really far inferior to the ordinary and classic method, and the above rule is almost abso-

lute: *Right blade, to the right, right hand; Left blade, to the left, left hand.*

5. *The Hand intended to guide the Blade, should ever be introduced first.*—This rule is perhaps more absolute still than the preceding. The object is both to protect the maternal and infantile parts, and to guide the blade. We cannot, therefore, be too careful, and if, when the head is at the vulva, or at the level of the inferior strait, one or two fingers, between the head and the vaginal walls, suffice, the palm of the hand must always be introduced when the head is higher up, and the thumb as well when the head is at or above the superior strait. In the latter instances, indeed, the ends of the fingers must be within the uterus, between the head and the cervix, to be sure not to seize the cervix between the blades, and to be sure that we are in the uterus and not in one of the

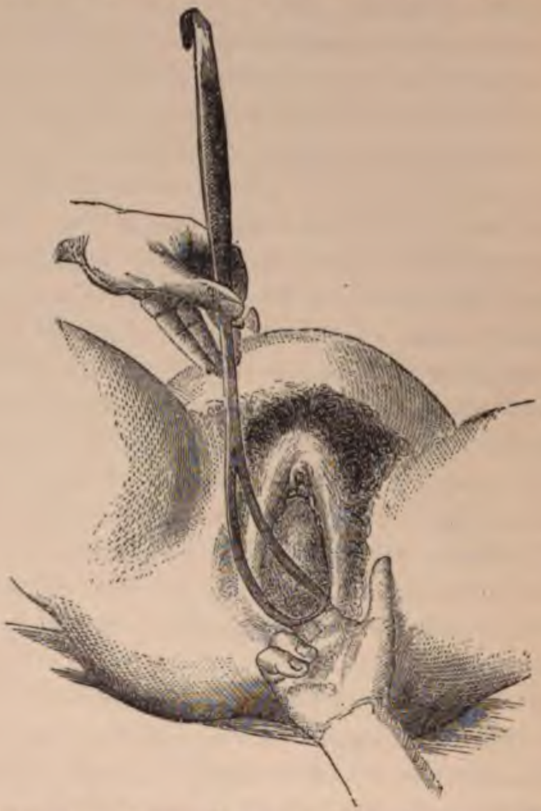


FIG. 82.—APPLICATION OF THE FORCEPS, HEAD AT THE VULVA. INTRODUCTION OF LEFT BLADE.

uls-de-sac. It is imperative, also, whenever the instrument is introduced vithin the uterus, to cause the fundus to be depressed, and the head teadied by an assistant, in order to bring the cervix and the head as near s possible to the operator.

We believe that it is always better, even when the head is at the infeior strait, to introduce the entire hand, exclusive of the thumb, into the agina. For it often happens, as Pinard has shown, that the fœtal head less freed from the cervix than is supposed. Often one of the cervical rders is in front of the head, and the other far up, and the cervix is ore or less wounded when the blades are introduced.

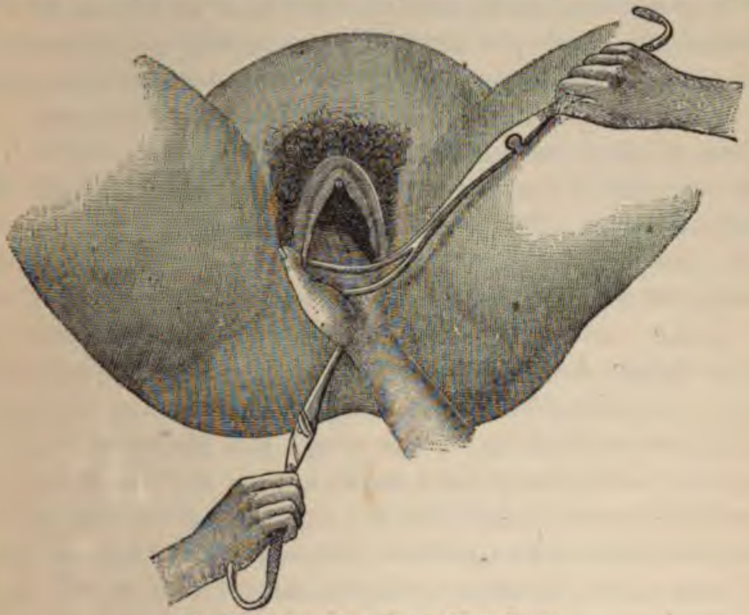


FIG. 83.—INTRODUCTION OF THE RIGHT BLADE.

We must never forget, further, that the use of the instrument requires ng apprenticeship, and that in the beginning of practice, we cannot take o many precautions. The insertion of the entire hand gives perfect curity to the accoucheur and his patient, and, by facilitating the introiction of the blades, allows of more regular application without increasg the suffering of the woman.

When the occiput is towards the pubes, or the sacrum, the guiding nd may be placed directly at the sides of the vulva; but when we are aling with oblique presentations, it is better to place the hand flat at the posterior commissure, along the posterior vaginal wall. Here we find the most room, and the hand will penetrate the more readily, and then again we may depress the perineum with the back of the hand, which gives more space for manipulation.

6. *The second Blade should always be inserted above the first.*—This rule is to be taken in conjunction with the fourth. We have already seen that the posterior blade must first be introduced. Now this blade may, according to the case, be the right or the left. It results that when the left blade has been inserted first, locking is not at all difficult, since the pivot is beneath the right blade, which is inserted second and above, (Fig. 83), but when the right blade has been inserted first, the conditions are not the same. In this case the left blade being inserted second, that is, above the right blade, the lock-surface is on the opposite side to the pivot. In order to lock, therefore, it is necessary to pass the left blade beneath the right. This is called *crossing* the blades. To accomplish it, the extremities of the handles are gently held, without making any traction, and they are passed one above the other, so that the right blade will lie above the left. The difficulties and the dangers of this little manœuvre have been much exaggerated. It succeeds usually without trouble. In order to avoid this crossing, Tureaux, Tarsitani, Thénance, Valette, have modified the forceps. Stoltz goes further still, and does away with crossing altogether. Seeing that the insertion of the right blade is usually more difficult than the left, whatever the position of the head, he first inserts the right blade, and then, to avoid crossing, he lifts this blade up, and introduces the second blade, the left, not above, but below the right. He then brings down the right, and the blades readily lock. We have used this method several times, and have succeeded without trouble. This proves again that there is nothing absolute as to the choice of the first blade for introduction. Everything depends indeed on the peculiarities of the case. The main point is not to insist on inserting the one or the other blade first or second, and if, the first in place, there is difficulty in inserting the second, we must take out the one in place, and try again with the other first. We will thus often in a surprisingly easy manner be able to insert and to lock the blades.

7. *At what Point of the Pelvis must the Blade be first introduced?*—We have seen that the blades should as far as possible be applied parallel to the head, and there are a number of ways of doing so, as, for instance,

the methods of Levret, Baudelocque, Mme. Lachapelle. Whatever the method, however, the absolute rule is never to endeavor to introduce the blades except during the intervals between the contractions.

A. *Levret's Method.*—The blade is seized, like a pen, near the lock, or at the end of the handle, no matter how, according to Tarnier, provided it be convenient for the operator. The convex surface of the fenestra is laid flat against the guiding hand at the vulva, and it is insinuated along this hand into the vagina, remembering that the latter's axis is from below above, and that consequently the handle must be depressed as the blade penetrates. To recognize the posterior and the anterior blades, it suffices to recall the position of the head, and the lesser curve being against that portion of the head which must come under the symphysis, the forceps need only be locked and placed in the situation it must occupy in the pelvis, in order to know which blade must be posterior, and which anterior. This little preliminary precaution, of utility in anterior positions, would lead us into error in posterior positions. In anterior positions we must take as our guide the occiput, in posterior the brow, and the reason is given further on.

The posterior blade in position, it should be directed backwards towards the sacro-iliac synchondrosis, and it is thus, in oblique positions, placed at the extremity of the bi-parietal diameter, where it remains fixed. The second blade, the anterior, is similarly directed backwards towards the opposite synchondrosis, and then it is placed behind the cotyloid cavity, that is to say anteriorly, making it traverse the entire lateral half of the pelvis. The manœuvre is accomplished by forcibly depressing the left blade, and carrying it from before backward, towards the anus. (We are speaking now, be it understood, of oblique positions, where the blades are applied directly to the right and left.) Velpeau has adopted this method.

B. *Baudelocque's Method.*—He supposes that the position of the head is always known, and that consequently we know *à priori* what point of the pelvis corresponds exactly to the bi-parietal diameter of the fœtal head, and, therefore, the position which must be assumed by each blade. He, therefore, places at once one blade in front, and the other behind.

C. *Mme. Lachapelle's Method.*—The two methods we have described possess serious disadvantages, and hence Mme. Lachapelle has modified them after the following manner, which has been adopted by all French accoucheurs and numerous foreign:

"If the blades are to be placed diagonally, one behind and to the side, the other in front and to the opposite side, it suffices to push the posterior blade directly along the sacro-sciatic ligament; nothing will stop it. I can then manage the other easier, by beginning with it. I hold it like a pen inclined over the groin, opposed to the side of introduction, and I insinuate the point of the fenestra in front of the sacro-sciatic ligament, and, as it enters, I depress the handle between the thighs till it lies below the anus. In this way, I make the point of the fenestra describe a spiral, which is guided perfectly by the fingers in the vagina. The fenestra is thus carried in front and above. The movement is rapid, and painless. It differs from Levret's method in that here it is the extremity, while in his method it is the border of the fenestra which leads the way. I ought to add that the spiral movement is only easy when the head is below the superior strait; when it is above, this movement is no longer possible, and we can only introduce it, if at all, after Levret's method."

Above the superior strait, indeed, the two blades are applied to the sides of the pelvis, and the head is grasped no longer regularly, but, as far as possible, diagonally from brow to occiput. The greater or less separation of the handles tells us that the head has been seized regularly or irregularly.

8. *The Blades must never be forcibly introduced.*—When the direction given to the blades is good and regular, it is surprising with what ease they penetrate. We should always proceed with the utmost gentleness, and be in no hurry; any resistance indicates a bad direction given to the instrument. Obstacles may depend on folds in the vagina or on the fœtal head. We must then lift or depress the blade, and find, with the hand in the vagina, free space. This is why we insist on the hand being in the vagina. Especially is this important when the head is high up, for then the end of the fenestra must enter the uterine cavity, and, at times, scarcely the finger-tips can reach the cervix and guide the fenestra, which must penetrate deeper even than these fingers. Let us add, too, that the cervix itself often runs away from the fingers. Here, then, we must redouble our care and gentleness. The fundus of the uterus must be depressed as much as is possible by the hand of an assistant, which, at the same time, steadies the head at the superior strait. This assistant may often thus feel the blades through the abdominal wall, and be cognizant of the fact that they grasp the head exactly.

In one word, the blades should penetrate easily, and adapt themselves, s it were, and, in case of obstacle, they should be withdrawn and rein- roduced in an inverse manner. In taking out the blades, they must fol- ow, of course, the direction opposite to that in which they were intro- uced.

The Locking.—When the first blade has been applied, it should be held place by an assistant, without the least traction, and the second, gen- ally the right, is inserted in the classic manner, and the instrument is be locked.

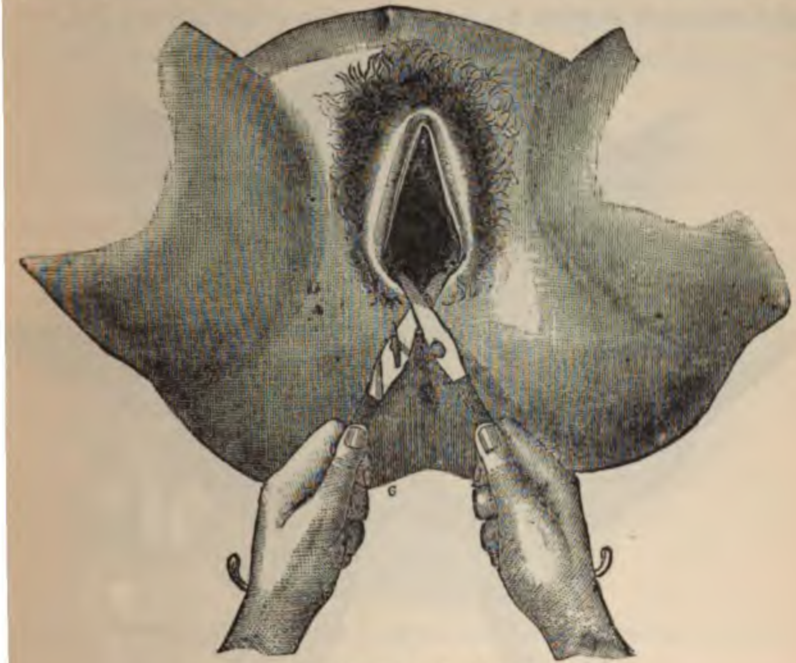


FIG. 84.—LOCKING OF THE BLADES.

If the blades have been well placed, and the head well grasped in its -parietal diameter, nothing is easier, usually, than the locking. It ffices to seize both handles, and to bring them together, the pivot inside e mortise, in which it fits exactly, and the pivot need only be turned to mly join the handles. (Fig. 84.) But this is not always the case, and e obstacles to locking may be three:

1. Locking cannot take place, because the right blade is below the left. e blades must be crossed.

2. It is impossible because the blades have not been introduced to the same depth, and the pivot does not correspond to the mortise. Then, say the authorities, we must pull out or push in one of the blades, to bring them to the same level. We are opposed absolutely to this. We must not forget that, in such cases, there is nothing to guide the blade which we are endeavoring to push deeper, and hence we may wound the fœtus or the maternal parts. We prefer to withdraw one blade, usually the right, and apply it anew.

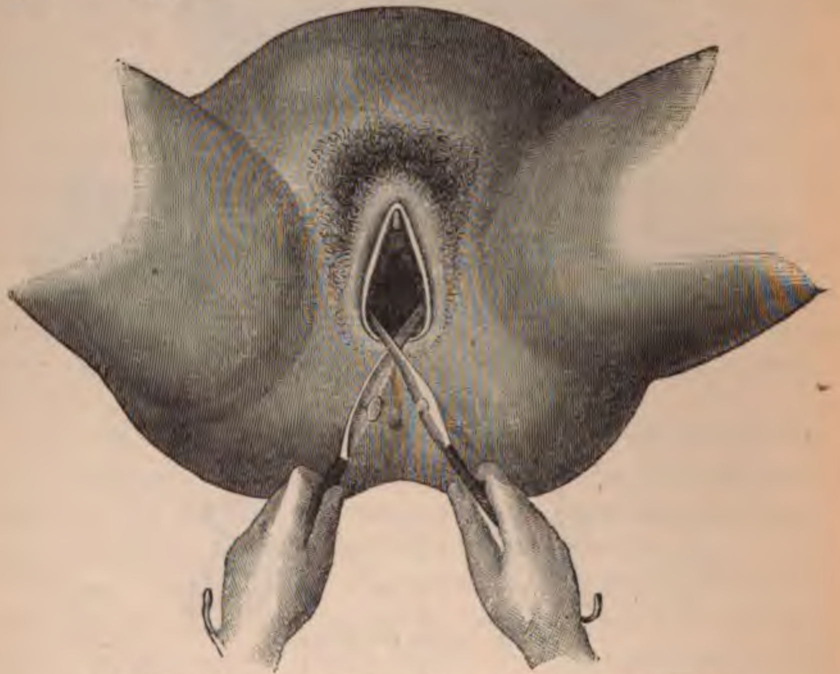


FIG. 85.—LOCKING OF THE BLADES WHEN THEY DO NOT EXACTLY CORRESPOND.

3. Locking is not possible because, although pivot and mortise are at the same level, the two blades are in different planes. Here again authorities advise seizing the blades, and by rotating them inversely to bring them into the same plane. (Fig. 85.)

We are absolutely opposed, in every sense, to this manœuvre. Either the head is well grasped and locking is easy; or else the head is badly grasped and locking impossible, and then the rule should be to begin over a hundred times, if need be, rather than to use any force. We must not forget that each blade of the forceps is a lever, and that every motion imparted to the handles is communicated, greatly exaggerated, to the extremi-ies of the fenestræ. Torsion, however slight at the handles, becomes onsiderable at the points of the fenestræ, and we might wound the fœtus r the mother.

Once locked, we must assure ourselves that the head is well grasped, nd grasped alone (without cord, cervix, or limb), and that the instrument irmly holds the head.

The finger in the vagina will assure us of the two first. As for the last, few tractions on the forceps will tell us of the hold on the head, and the paration of the handles as to whether the head is grasped regularly or t. (Fig. 86.)

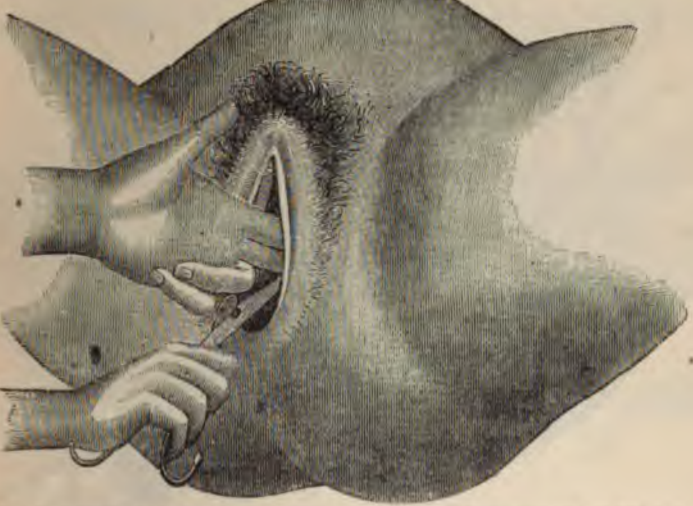


FIG. 86.—INTRODUCTION OF THE FINGER TO ASSURE EXACT APPLICATION OF THE INSTRUMENT.

With Tarnier's forceps, we must gently compress the head with the ndles, bring the screw in contact with the handles, turning the more we expect greater resistance. The traction rods are articulated to the nsverse bar, and we proceed to extraction.

Extraction.—The fœtus need now only be delivered by traction on the ndles, and delivery will be the easier when we make the head execute means of the instrument the movements which it would spontaneously ke in normal labor. The tractions then must not only engage the ad, but must make it traverse the vagina as nearly as possible in the lvic axis, and in certain posterior positions we must make the head rotate, in order that, in vertex presentations, the occiput may come un the symphysis, and the chin, in face presentations. Although, if n be, we can deliver with the occiput posterior in case of vertex presen tions, we must bring the chin under the symphysis in order to deliver face presentations.

The tractions, then, must be different according to the elevation the head.

If it is above or at the superior strait, we must, at the outset, ma traction backwards and below, in order to engage the head and bring

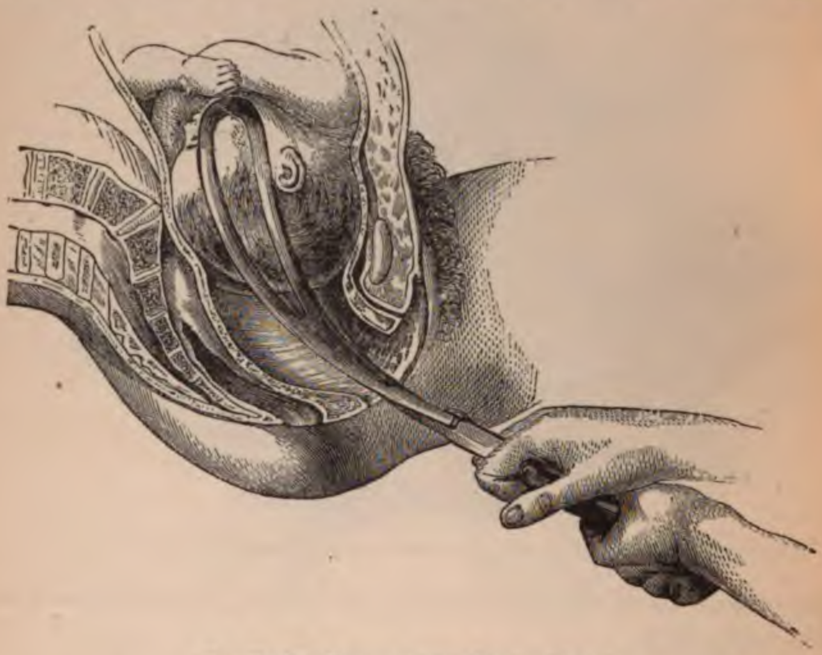


FIG. 87.—THE FORCEPS AT THE SUPERIOR STRAIT.

below this strait. Unfortunately these tractions can never be sufficiently directed backwards, on account of the perineum against which the forceps press, and to remedy this Hubert and Moralés devised their forceps, and Tarnier gave to his first model the perineal curve nearly similar to that in Moralés' instrument.

Once the head in the cavity, the tractions should be directed a little more forwards, so that when the head has reached the level of the inferior strait, or when the forceps are there applied at the outset, tractions are nearly horizontal. (Fig. 88.)

The head at the vulva, traction is made from below upward, that is to ay, the forceps are lifted up towards the abdomen of the mother. Here, ndeed, traction is nearly useless, the head has simply to be disengaged, nd once the occiput under the symphysis, not only must we no longer ull on the forceps, but, with the instrument towards the mother's ablomen, we must firmly hold the head, oppose its too rapid exit, and allow t to issue from the maternal parts but very slowly. (Figs. 89 to 91.)

It is not enough, indeed, to sustain the perineum, as is represented in 'ig. 89. To prevent its rupture, we must give it time to relax, and if we o not hold back the head enough, the perineum will tear under the suporting hand. Often, indeed, at this very moment, the woman, against er will, makes violent expulsory efforts, and the head, driven violently tside, tears the perineum notwithstanding the accoucheur's hand. The tter plan is to slowly disengage the head, holding it back as much as ssible, and completing delivery between the pains, and if the perineum ems too distended and ready to tear, to make a lateral incision, and us avoid deep laceration.

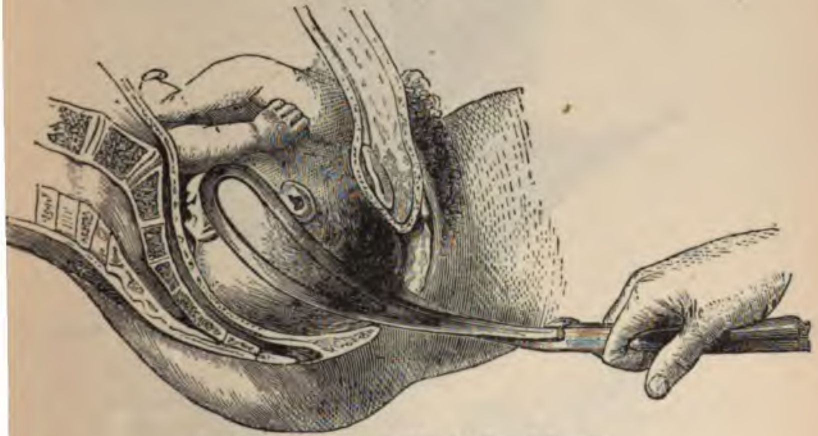


FIG. 88.—THE FORCEPS AT THE INFERIOR STRAIT.

[The above method will succeed very well in multiparæ, but in primiræ, where the integrity of the perineum is much more in danger, we lieve the following to be far preferable: As soon as the occiput has been ought well under the pubes, and the perineum begins to distend, adinister chloroform to the surgical degree, in order to abolish entirely voluntary expulsory efforts on the part of the patient, and then, remov-

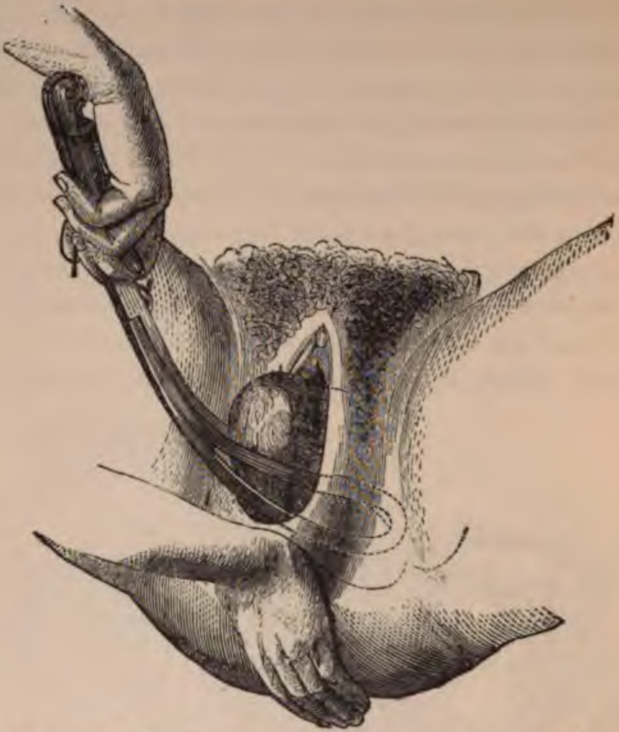


FIG. 89.—THE FORCEPS WITH THE HEAD AT THE VULVA. (The left-hand on the perineum the position recommended by the German School.)

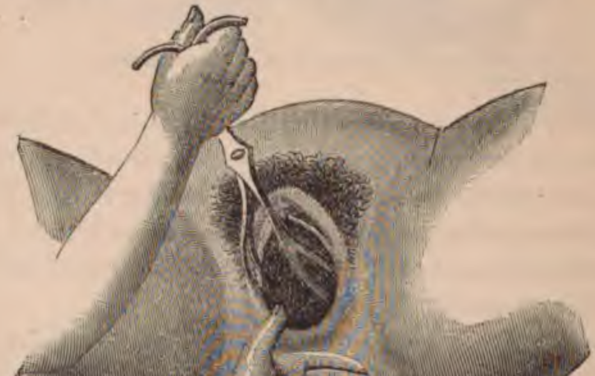


FIG. 90.—DELIVERY OF THE HEAD WITH THE CLASSIC FORCEPS. (French method.)

ing with care the forceps, proceed to gradually shell out, as it were, the head, holding it back with one hand, and with the fingers of the other gradually relaxing and pushing back the perineum over the head. One finger in the rectum may be used to slowly extend the head, but this is not at all necessary. By this means it will often be possible to deliver without any laceration of the perineum whatsoever, and without resorting to episiotomy. It is at this stage that, for us, chloroform is of greatest utility in labor, but it must be pushed to the surgical degree.—Ed.]

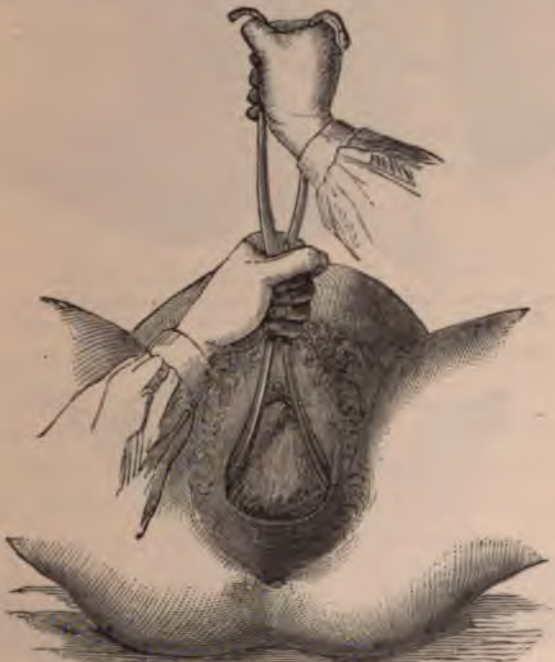


FIG. 91.—DIRECTION OF THE FORCEPS AS THE HEAD IS BEING DELIVERED.

We cannot emphasize enough the fact that the best way to save the perineum is to extract the head very slowly, except of course where there is indication for haste in the interest of mother or of child. Here especially is it wise to perform episiotomy.

When all that remains is to disengage the head, it suffices to seize the instrument in one hand, the left usually, (in case of Tarnier's forceps, the four branches together), and to lift the instrument slowly towards the mother's abdomen (See Fig. 91); the other hand may sustain the perineum, or do episiotomy, if need be. Again, then, here no traction be made, and retain the head, when necessary, to prevent too rapid

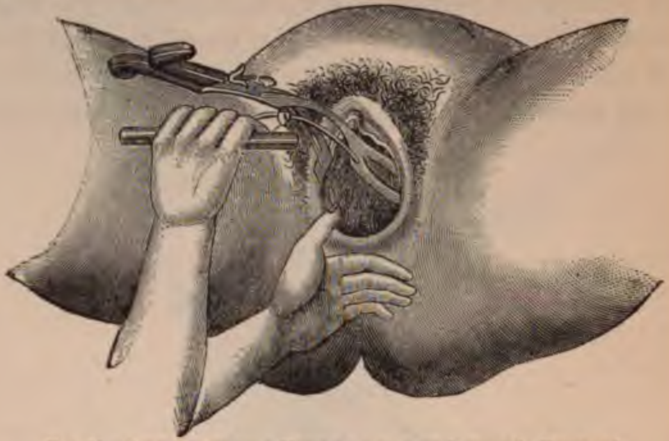


FIG. 92.—DELIVERY OF THE HEAD BY MEANS OF TARNIER'S FORCEPS.

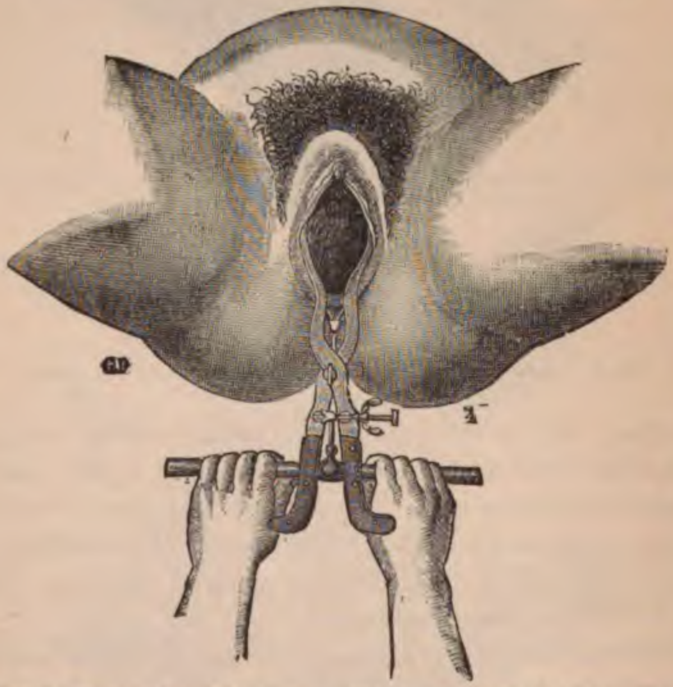


FIG. 93.—TRACTION BY TARNIER'S FORCEPS. Position of the hands on the transverse b

When traction is made with the classic forceps, we must avoid compression on the handles. Now this is, unfortunately, instinctiv nvoluntary. As we increase the traction, the hands involuntarily squeeze he handles and augment compression, and so it is advised to place beween the handles a rolled napkin, which serves to limit compression. It s in order to fix the head, and avoid exaggerated compression, that Tarier united his prehensile branches by a transverse screw, destined to nake fixed and regular compression on the fœtal head.

But as we have seen, this compression cannot be limited; for we are ften obliged to screw tighter when the head has descended somewhat, iminished in size by the compression of the pelvic walls. In order to void this repeated tightening of the screw, Tarnier recommends that hen the screw has first been tightened, the handles be pulled on a little n order to mould the head, and then we may turn the compression screw rmly, and the head is tightly held and so retained.

Method of Action of the Forceps.

All authorities are agreed in assigning to the forceps three methods of ction. It is a tractor; it is a compressor; it acts dynamically, by awakeng uterine contraction.

These three methods are incontestable, but there is one above all which eads the others, and for which the forceps was constructed—*it is an agent or traction.* As for compression, it is a mere accessory, and may even ecome dangerous. We should never count on compression when we ish to end delivery by means of the forceps.

The Forceps as a Tractor.—In order that it may be perfect in this repect, the traction should be always directed in the axis of the pelvis, hether we use the ordinary instrument with great pelvic curve, or the traight forceps. Now all authorities are agreed that when the head is t the superior strait, and, therefore, of course, when above this strait, e cannot make traction backwards, since the perineum opposes. Even t the inferior strait, and at the vulva, says Tarnier, traction is always adly made, on account of the form of the instrument. Therefore it is hat all authorities are agreed in varying the traction according to the eight of the fœtal head. Make traction downward and backward when he head is above the superior strait; make traction downward in the avity; make traction horizontally at the inferior strait; lift up the intrument as the head descends, and pull gently upwards when the head s at the vulva.

But, as said Pajot, in 1877, "to pull downwards does not mean, as all accoucheurs seem to think, to pull the entire instrument down by hanging on the handles. It means to pull so that the upper extremity of the fenestræ shall come down and backwards, an impossible manœuvre when we pull directly on the handles in this direction, for then the extremities of the fenestræ, which should come downwards and backwards, tend downward and forward. But if the left hand seizes the instrument firmly near the vulva (Fig. 94), and if the handles are carried by the other hand at first downward and a little forwards, and then, as the head descends,

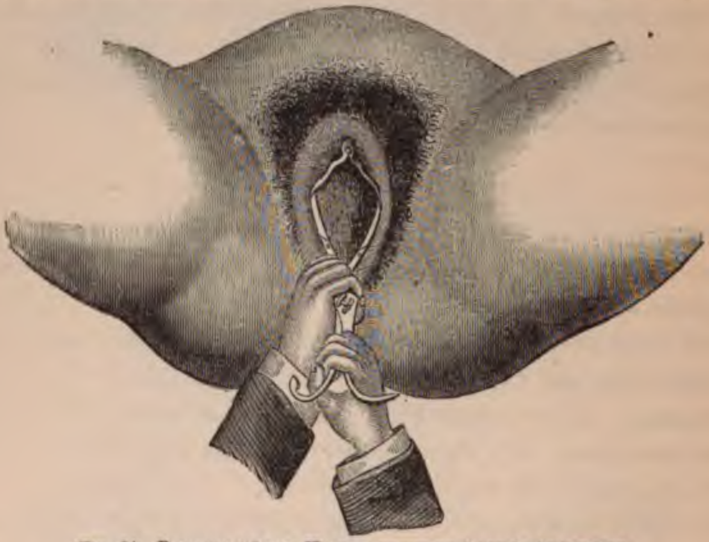


FIG. 94.—POSITION OF THE HANDS EXECUTING PAJOT'S MANŒUVRE.

if the left hand depresses the blades, until both hands end by lifting up the instrument, never letting them touch the abdomen of the mother, if this manœuvre is executed, we approach the true axis, and exact realization could scarcely be more advantageous."

"Tarnier says that the forceps, thus used, is no longer an agent of *pure traction.* It is transformed into a lever, the fulcrum of which is at the end of the handles, the force at the lock, and the resistance at the head. It acts, hence, according to the curve which the fenestræ tend to describe, and since this curve is first directed backwards, the force is also in this direction. The head, hence, is directed too far backward and it tends to flatten itself against the sacro-vertebral angle." Tarnier vehemently attacks Pajot's method, and declares it impracticable when the head is at the superior strait, for the lock of the Instrument is between the labia ajora. "When the centre of the head has reached the level of the perior strait, this manœuvre, possible perhaps, although inconvenient, ould be dangerous, because the fenestræ would cut the perineum each me the instrument slipped. Finally, at the inferior strait and the vulva, e extremities of the blades tend to tear the perineum."

Although we accept the objections which Tarnier has brought against ajot's manœuvre at the superior strait, we reject them when the head s passed it, and has arrived in the cavity. Where the head, in occipito-sterior position, is above the cavity, and resists direct traction, Pajot's anœuvre may be of great service. It has assisted us in two cases. The rceps, if you please, no longer acts as a tractor, but it acts certainly as agent for extraction, since it brings the head down which resists pure tempts at traction. But at the inferior strait, Pajot's manœuvre neces-rily extends the head, and ruptures the perineum, and we much prefer cause the head to rotate artificially; and then to reapply the instrument, d deliver the head, occiput to the pubes. We are, it is true, forced to ake two applications of the forceps, but we avoid rupture of the perine-m. Pajot's method, therefore, we believe, is only of use to bring the ead into the cavity, and thus to allow rotation of the head, which has ot occurred spontaneously.

Thus it is then that, particularly at the superior strait, the forceps is cking as a tractor, and this is why Hubert, Moralès, Hermann and Hart-ann endeavored to modify the instrument, so as to enable traction to be ade in the axis of the pelvic strait. Tarnier's forceps, with its indicator eedle and its traction rods, constitutes, to a degree, real progress in this irection. Unfortunately it is, in particular, in the cavity and at the ferior strait that this forceps can be used to the greatest advantage, and ere the classic forceps can exert traction better in the axis of the pelvis.

At the superior strait, above all higher, the classic forceps and that of arnier present the same disadvantages. Whatever the instrument, it nnot make traction backwards. But with Levret's forceps we are aware f resistance offered, we can vary the direction of traction, we are con-ious of all the force we employ, and of the results. Nothing of the kind ith Tarnier's instrument. It is the needle alone which guides the ac-oucheur, it is it alone which registers the amount of traction. Do we ake traction in the pelvic axis? Not at all at the superior strait; only trifle in the cavity and at the inferior strait, since it is impossible to now the mathematical axis of the pelvis. Nevertheless, the younger

French practitioners are daily making greater use of the Tarnier instrument. In England, Alexander Russell Simpson reported on this instrument before the Edinburgh Obstetrical Society in July, 1884. He has adapted the principle of axis traction to Simpson's forceps.

[In this country the opinion of those who have used Tarnier's forceps is not in agreement with that expressed by Charpentier. For ourselves, it is at the superior strait or above it that we should use Tarnier's instrument, or one similar to it, for the reason that here, in particular, backward traction is indispensable to a greater extent than is possible by means of the Simpson or Eliot forceps, which are the favorites with us. In the cavity, or at the inferior strait and outlet, we personally do not desire a better instrument than the Vienna Simpson. At the superior strait we do not contend that any axis-tractor as yet devised will allow us to pull in a mathematical axis. All we believe we accomplish is to make our traction more in the axis of the pelvic inlet, for the very reason that we are enabled to pull in a direction further backwards. We have never noted in such cases that the result of our traction seemed to be rather to tilt the head forward.

In regard to Tarnier's instrument, Lusk says: "In all high operations I cannot too strongly recommend the ingenious forceps of M. Tarnier. To one accustomed only to the familiar forceps, the facility with which delivery can be accomplished by Tarnier's instrument is incredible. It is a question whether axis-traction forceps should be employed at all at the inferior strait."—Ed.]

The Forceps as a Compressor.—The forceps compresses the fœtal head, and thus diminishes its volume. But this compression has its limits, and is purely accessory to traction. Hersent, Baudelocque, Pétrequin, Delore, Chassagny, Budin, have made interesting researches on this point, which agree in the essentials.

Baudelocque drew the following conclusions: The diminution in the fœtal head varies according to the state of ossification of the sutures and the fontanelles, but it is never as great as has been claimed, rarely exceeding four to five lines when the instrument is applied to the sides. The divergence of the blades is not an accurate measure of the compression force. The diameter in which the head is compressed does not diminish in the same proportion in which the other is increased. The increase is scarcely one quarter of a line.

Pétrequin, on the other hand, claims that the diameter opposed to the ne grasped by the forceps' increases almost constantly. In agreement ith Baudelocque, he points out that the bi-parietal diameter diminishes ut little, and that the occipito-frontal is always more reducible.

Delore (1865), in studying this subject, drew up the following tables:

Pressure between the Blades of a Forceps.

Diameter O.F., pressure of 231 pounds, no fracture; Diameter B.F., ressure of 220 pounds, no fracture.

'ressure made either by a forceps which slips and compresses at the extremities of the fenestræ, or else at the sacro-vertebral angle and the pubes, in case of sacro-pubic contraction.

Compressed diameter.	Agent.	Force.	Effects.
B. P.	Convex body.	41 lbs.	Transitory.
"	"	50 lbs.	"
"	"	57 lbs.	"
"	"	112 lbs.	Depression with fracture.
"	"	132 lbs.	Fracture.
O. F.	"	177 lbs.	No effect.
"	"	99 lbs.	Depression, reducible.
"	"	121 lbs.	Depression.
B. P.	Angular body.	44 lbs.	Persistent depression, without fracture.
"	"	176 lbs.	Enormous depression with fracture.

Diminution of the Head by the Forceps.

	Diameters.	Pressure.	Reduction.	Increase of opposite diameter.	Results.
audelocque,	B. P.	Enormous.	.15 in.		Frequently fractures.
	O. F.	——	.35 in.		
étrequin,	B. P.	"	.39 in.	.117 in.	
	O. F.	"	——	.117 in.	
elore,	B. P.	121 lbs.	.39 in.		
	O. F.	——	——	.234 in.	Rigid head.
	O. F.	132 lbs.	.58 in.	.312 in.	Soft head.

Diminution through Limited Compression.

Head.	Convex pressure on one parietal.	Reduction.
Soft and large,	41 lbs.	.66 inches.
"	83 lbs.	.98 "
Harder	57 lbs.	.39 "

Studying, further, the force used with the forceps, his results were:

Traction.

A man without fulcrum,	88 lbs.
" with "	198 lbs.
Two men without "	176 lbs.
" with "	286 lbs.

Pressure.

Forceps	Small, elastic,	constriction	at end of blades,	22 lbs.
	" "	"	at middle of blades,	44 lbs.
	Mean	"	at end of blades,	99 lbs.
		"	at middle of blades,	121 lbs.
	Very large,	"	at end of blades,	110 lbs.
	"	"	at middle of blades,	143 lbs.

To what pressure on the head corresponds a known force? The f lowing table shows the dynamometric measurements with his forceps:

44 lbs. traction corresponds to	19½ lbs. pressure.
66 " " "	39 " "
86 " " "	46 " "
105 " " "	77 " "
110 " " "	52½ " "
132 " " "	59⅗ " "
176 " " "	110 " "

Resuming, he believes that the force should never exceed 176 pound and from his researches he deduces the following conclusions:

1. The head resists the more, the greater the pressure surface.
2. It is difficult to foretell the amount of pressure which will produ a fracture.
3. A persistent depression is not always accompanied by fracture.
4. Compression in the occipito-frontal diameter is better support than in the bi-parietal.

5. The head compressed transversely augments in particular in the trachelo-bregmatic diameter.

6. The pressure exerted by the blades is about equal to one half the traction force.

Budin has made similar researches: "After having, by means of tractions measured by the dynamometer, caused the head to partially pass through the superior strait of a contracted pelvis, I froze it in this position. Then removing it, hard as a rock, I measured directly the diameters, and proved, with Pétrequin and Delore, that if the head is compressed in one direction, the opposite diameters increase. Further, the sub-occipito bregmatic suffered the greatest modification, and also the trachelo-bregmatic."

The following table gives Budin's results:

Experiments.	Diameters of the normal head.		Degree of pelvic contraction.	Forceps applied at.	Traction exerted.	Changes in the diameters.
		Inches.				Inches.
No. 1.	O.M.	3.74	2.06 inches.	Forehead to occiput.	35 1-5 lbs.	
	O.M. Max'm,	3.9				3.97
	O.F.	3.35				3.12
	S.O.B.	2.93				3.51
	B.P.	2.69				
	B.T.	2.16				2.06
	Bi-Mast'd,	2.18				
No. 2.	O.M.	3.61	The head was frozen lying on the table.	Forehead to occiput.	Great compression.	3.27
	O.F.	3.19				3.08
	B.P.	2.5				2.84
	B.T.	2.3				2.57
	S.O.B.	2.8				3.39
No. 3.	O.M.	5.07	3.12 inches.	From right coronal protuberance to left occipito parietal region.	Head engaged with 44 lbs., traction at 19 4-5 lbs.	5.42
	O.M. Max'm,	5.18				5.57
	O.F.	4.7				4.87
	S.O.B.	4.05				4.32
	B.P.	3.7				
	B.T.	3.3				3.15
	Bi-Mast'd,	2.9				
No. 4.	O.M.	4.95	Head frozen lying on the table.	Forehead to occiput.	Great compression.	4.79
	O.M. Max'm,	5.18				5.26
	O.F.	4.42				4.21
	B.P.	3.7				3.80
	B.T.	3.12				
	Bi-Mast'd,	3.04				
	S.O.B.	3.74				3.97

The diminution in the head, therefore, to be inoffensive, should scarcely exceed .39 of an inch, and this, according to the advocates, is one of the advantages of Tarnier's forceps. The compression exerted by the screw is determined before traction is made, and this traction being made through rods independent of the handles, and on parallel rods, compression will remain constant and will not vary, as must happen with the classic forceps, where the accoucheur instinctively compresses with the increase in the resistance to traction. We have elsewhere seen that this proposition is not absolutely exact, because we are often obliged to screw down further, a proof that the head is more compressed at the end than at the beginning of the tractions.

The Forceps as a Dynamic, or Oxytocic Agent.—The forceps, further, awakens uterine contractions, often, indeed, to such an extent as to interfere considerably with the introduction of the second blade. This action, however, is far from being constant, and it has been much exaggerated by Baudelocque, Stein, Kilian, etc. At times they are only momentarily increased; and then, again, they are entirely wanting.

SPECIAL RULES.

The forceps, we have seen, may be applied in presentations of the head, of the face, of the after-coming head, of the decapitated head. In each instance the head may be more or less elevated, and it may be situated: 1. Below the superior strait, in the excavation, and more or less near the inferior strait. 2. At the level of the superior strait, in part engaged, but projecting more or less above the excavation. 3. Entirely above the superior strait, and more or less movable.

The general rules, of course, are the same in each instance, but the particular rules vary not only in each case, but also in the different positions of the head. We will study each in succession.

Application of the Forceps in Vertex Presentations.

A. *The Head in the Cavity, or at the Level of the Inferior Strait.*—The vertex may present in O.P., O.S., O.I.L.A., O.I.L.P., O.I.L.T., O.I.R.A., O.I.R.P., O.I.R.T.

1. *Occipito-pubic Position.*—The occiput, according to the descent of the head, is situated either behind the symphysis or beneath. The forehead is backward, the bi-parietal diameter is in the transverse of the cavity, or of the inferior strait—in other words, the sides of the head correspond to the sides of the pelvis. The forceps are applied ***directly,*** that is to say, the blades are parallel both to the head and to the pelvis. There-

fore left blade to left side of head, and right blade to right side of head. The forceps applied, the lesser curve lies directly under the lower border of the symphysis. The blades must be pushed in less deeply the lower the head. It is in every way advantageous to begin here with the left blade. Extraction is usually easy. We must simply make traction at first downward, and then in front, until the occiput is engaged under the symphysis (this is very important), and then only, slowly lift the handles to extend the head outwardly, even as in normal labor, by its sub-occipito-bregmatic, sub-occipito frontal, sub-occipito-mental, diameters. (See Fig. 91.) (We are speaking now of the classic forceps, that of Tarnier telling us by its needle in what direction we must make traction.) Never hurry, unless the interest of mother or of child calls for haste. Give the soft parts time to relax; watch carefully the perineum, ready to perform episiotomy in case of rapid delivery being needed, always bearing in mind the principle that except in an emergency, it is far better to work slowly than hastily in the delivery of the head. Let the perineum relax, hold back the head if need be, and allow it, as far as is possible, to be born only in the intervals of the pains. (See Figs. 91 and 92.) The head delivered and, then alone, remove the forceps, contrarywise to the opinion of Mme. Lachapelle, [and contrary also to the opinion of the generality of American accoucheurs, for reasons we have already given—Ed.], who taught that the forceps should be removed as soon as the head was free from the bony walls.

2. *Occipito-sacral Position.*—The bi-parietal diameter of the head still corresponds to the transverse of the pelvis, and the sides of the head to those of the pelvis, but the occiput lies backward, the forehead anteriorly. Here, also, the forceps are applied directly, left blade to left, and right to right side. We are, therefore, in opposition to the rule which says that the lesser curve of the forceps should be directed towards the part of the head which is to come under the symphysis, that is to say, the occiput; it would be impossible, indeed, to conform to this rule in the present instance, for we would be obliged to insert the left blade to the right, and the right to the left, and we have seen that the only absolute rule for the forceps is left blade to left, and right to right. [Richardson, of Boston, advocates, in posterior positions, the insertion of the blades inversely to the ordinary way, then bringing down the head to the pelvic floor, removing the blades, and, if rotation does not occur spontaneously, re-ap-

plying them in the classic fashion. This manœuvre has answered us well.—Ed.] The forceps then is applied as in the preceding instance, and the lesser curve corresponds to the forehead. The left blade, here as well, had better be introduced first. (See Fig. 95.)

When the head has been regularly grasped, the instrument is parallel both to the head and to the pelvis. All that remains is delivery. Here authorities are not in accord. Some are in favor of delivering with the occiput posterior, others counsel artificial rotation in order to bring the occiput under the pubes, and then to re-apply the forceps.

We believe in always attempting rotation. But this attempt should only be made when the head has reached the pelvic floor, and then either rotate, or deliver with the occiput posterior. (Figs. 96 and 97.) At the outset traction must be made downward and backward, in order to bring down the occiput. This is far from easy, and hence various methods.

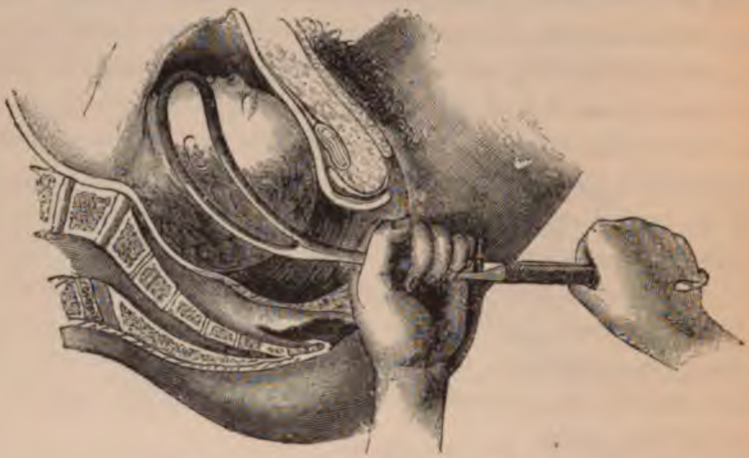


FIG. 95.—DELIVERY OF THE OCCIPUT POSTERIOR.

Hubert (de Louvain) advises placing a firm filet over the pivot, an assistant pulls by this strongly downward, while the operator makes traction with one hand at the lock, the other holding the handles.

Couzot (de Dinan) presses downward with his knee at the lock, while the hands simply control the handles. Chailly knelt before the bed, placed the handles under his shoulder, the two hands at the lock, and pulled downwards with all his might.

Above all these manœuvres, more or less violent, we much prefer that of Pajot. (See Fig. 94.) Seize the instrument firmly near the vulva, carry the handles with the other hand at first downward and a little outward; then, as the head descends more and more, the hand near the vulva endeavors to depress the blades. Finally, when the head reaches the perineum, depress the handles so as to extend the head. (Fig. 97.) The forehead thus comes behind the symphysis, as the occiput descends along the posterior vaginal wall.

Pajot's method is certainly less violent than the others, but the delivery of the occiput posterior necessarily entails laceration of the perineum, to say nothing of the fact that the head, in passing along the posterior wall of the pelvis, greatly distends it, and exposes it to bruising, which may be of great consequence. Finally the blades may slip, if the head does not descend, or only with difficulty. Hence, as soon as the head reaches the bottom of the cavity, we proceed no further with Pajot's method, but endeavor to rotate artificially. We only deliver the occiput posteriorly

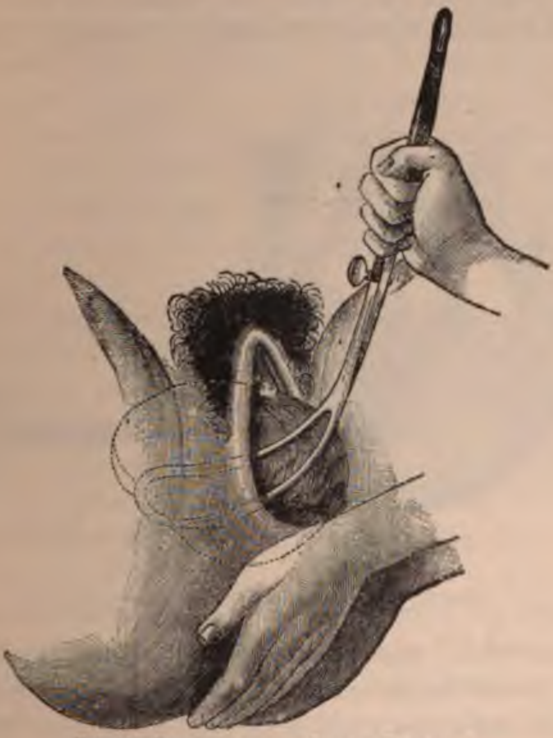


FIG. 96.—DELIVERY OF THE OCCIPUT POSTERIOR.

when we are forced to do so, that is to say, when we cannot rotate with the forceps. Often this is possible, but then again not at all so, and then the efforts we make may damage the mother as well as the infant, and we must extract the occiput posterior, even if we do tear the perineum; and this we can limit by lateral incisions.

The method which consists in bringing the occiput forward is not admitted by all accoucheurs. Smellie was the first to practise it, and Puzos, Levret, Deleurye, Petit, Astruc, Solayres, Baudelocque, Herbiniaux, Capuron, Moreau, Naegelé, Chailly and Cazeaux rejected it. To-day, neither Stoltz, Pajot, Grenser, Hyernaux, Chassagny, Villeneuve nor Sentex, will adopt it. Exceptionally resorted to by P. Dubois and Danyau, it has become customary with Depaul, Blot, Joulin, Bailly, Tarnier and his pupils, and we are ourselves partisans in its favor. The adversaries of the method say that it makes the head rotate more than a quarter, while the body is immobilized by the contraction of the uterus, and that hence it exposes the infant to grave lesions in the cervical region, about the atlo-axoid articulation. Although facts are against this protest, Tarnier, from his personal experiences, has routed all the objectors. "From experiments on many cadavers of new-born infants I have proved that when the head is turned one-half the circumference, the shoulders being steadied, the motion does not alone occur at the atlo-axoid joint, but

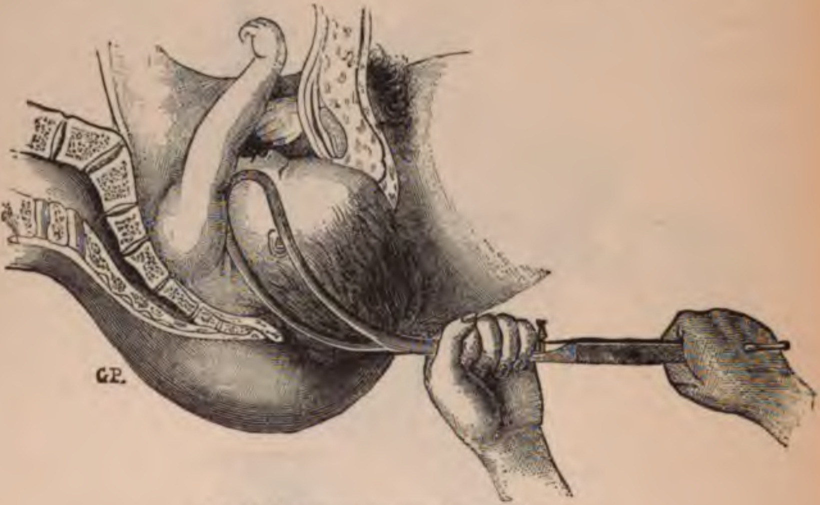


FIG. 97.—DELIVERY OF THE OCCIPUT POSTERIOR.

throughout the whole extent of the cervical, and a portion of the dorsal spine, the vertebræ twisting spirally. In order to make the head thus rotate, great force must be used, and yet careful dissection has failed to reveal the slightest lesions in the membranes or the spinal marrow. But, it may be said, if the vertebræ are twisted, the spinal cord must be compressed. To guard against this objection, I substituted for the cord a fluid column, connected with an external glass tube. Every compression of the canal caused the fluid to mount in the tube, and yet torsion of the head did not. Strong flexion of the head did cause it to rise. I am thus convinced that exaggerated rotation compresses the cord less than as great flexion as we are obliged to produce in order to extract the occiput in posterior positions." Ribemont resumed the experiments of Tarnier, and reached the same conclusions. After having frozen a fœtus in a position where the chin looked backward and the occiput anteriorly, he made horizontal sections at different levels of the vertebral column, and vertical sections antero-posteriorly, and his studies of the sections resulted in the following conclusions:

1. As Tarnier has shown, torsion of the neck affects the whole cervical column, and six or seven of the dorsal vertebræ.

2. This torsion is not greater at the first than in the last cervical vertebræ.

3. At no point is there deformity or flattening of the rachidian canal.

4. The spinal marrow is at the centre of this canal. It is, therefore, not compressed, but is turned on its axis, parallel to that of the vertebræ.

Bailly has very exactly described the manœuvre: "The diagnosis of the position having been made with the greatest care, the forceps is applied as usual. The head is grasped by its sides, the concavity of the border of the blades being turned towards the fronto-bregmatic region. If the head be already near the vulva, we may at once begin to rotate. If, however, it be still above the inferior strait, it is brought down to the pelvic floor until this musculo-membranous plane is considerably distended. This lowering of the head is to me of the greatest importance. On the one hand, we thus conform more nearly to the natural process, when, in general, the head does not rotate till it reaches the pelvic floor; and, on the other hand, artificial rotation is easier, and freer from danger to the mother, since the head and the instrument are turned in but one axis, and where the surroundings are largely soft and mobile, instead of being turned at the centre of a curved and a rigid canal. (Fig. 98.)

The head, then, having been lowered, and the perineum partially distended, movements of rotation are applied to it, to bring the occiput under the pubes. To accomplish this, the handles of the forceps are carefully and slowly turned towards the side of the pelvis opposed to which the occiput must follow, and this latter must be conducted along the line it would naturally pursue, that is to say, forwards and to the right in the left postero-lateral position, forwards and to the left in the occipito-iliac right posterior position. This manœuvre never requires effort on the part of the accoucheur, but only, at the start, moderate impulsion. As soon as the occiput has crossed the transverse diameter of the genital tract, especially if uterine contractions are present, rotation takes place alone and quickly, and the occiput is in front, and the concave border of the forceps against the fourchette.

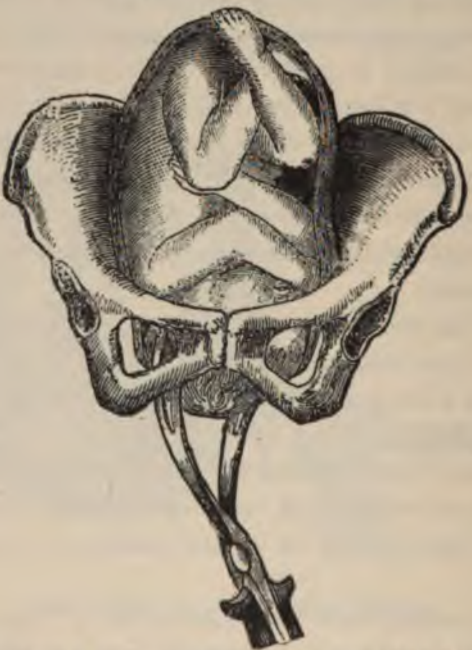


FIG. 98.—ARTIFICIAL ROTATION IN POSITION O.I.R.P.

Notwithstanding this reversal of the normal position of the forceps, the head may still be extended and delivered. A new and regular applicaion of the instrument seems to me, therefore, superfluous in the great ajority of cases. In many cases, indeed, both the head and the instru- ent are expelled together by a uterine contraction, as soon as rotation as been completed.

It is surprising, indeed, with what ease this rotation is made. With ailly we believe it useless, ordinarily, to remove and re apply the for- eps, at least in multiparæ; but in primiparæ, with narrow vulva, it is equently of great advantage to remove the forceps, and re-apply it to e head with occiput under the pubes.

[The absolute lack of reference to the practice of American accou- eurs in the delivery of occiput posterior positions, is valid excuse for ference to the matter here. It is generally agreed that the main factor terfering with anterior rotation, in a normal pelvis, is lack of flexion of e head. When flexion is complete, in the large proportion of cases, as on as the occiput reaches the pelvic floor, other conditions normal, it ill rotate spontaneously forward. Where flexion is not complete, we e satisfied that application of the forceps in the reverse direction and mpletion by them of flexion, will often be sufficient to cause the head rotate spontaneously. If this be the case, an effort in this direction ould ever be made before attempting artificial rotation by either the nd or the forceps. Lusk says that "an attempt to rotate the occiput ound to the symphysis by instrumental means, is rarely successful." a discussion in 1881 before the American Gynecological Society, Saw- er stated that he was opposed to dragging the head posterior by means the forceps, and counsels rotation under an anæsthetic by means of the tire hand in the vagina. This, to us, seems far preferable to the arti- ial rotation by the forceps, since the hand is a sentient agent. Richard- n stated that, in a large experience, he had never failed to see the occi- t rotate spontaneously. Reamy nearly agreed with him; the late Albert . Smith said that in his experience, with a normal head and a normal lvis, rotation always occurred. In a number of cases seen by us, in rtainly the majority, spontaneous rotation occurred as soon as the head ached the floor of the pelvis; in one case lack of rotation was due to ck of flexion, and, on correcting this with the forceps applied inversely, ontaneous rotation immediately occurred. In three or four cases, the sition was persistent, and the head and shoulders so firmly pressed own, that any attempt at artificial rotation could only have resulted in failure, and in possible injury, so that we delivered with the forceps, saving the children, but of course ploughing up the perineum.—Ed.]

3. *Position O.I.L.A.*—The occipito-frontal diameter lies in the left oblique of the pelvis, the bi-parietal in the right oblique. The left side of the head is backward and to the left; the right forward and to the right. The forceps, then, applied symmetrically to the head, will be oblique to the pelvis. One blade being in front, and the other behind, the application is oblique. The posterior, first applied, is the left blade, and lies in front of the left sacro-iliac synchondrosis on the left lateral side of the head. The right blade, at first directed backward, in front of the sciatic ligament, should be brought forward behind the cotyloid cavity, on the right side of the head, after Mme. Lachapelle's method. The forceps, when locked, will seize the occiput by its lesser curve directed towards the left thigh of the mother. (Fig. 99.) The first tractions should aim at bringing the head down to the pelvic floor, and then it is to be rotated from left to right, to bring the occiput under the pubes. This once accomplished, the instrument is symmetrical to head and to

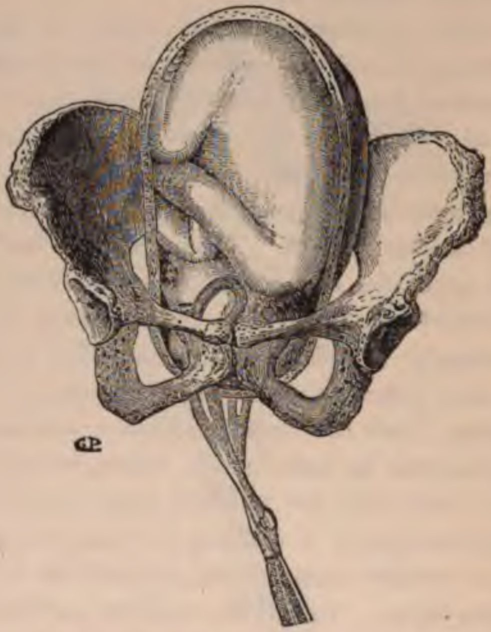


FIG. 99.—APPLICATION OF FORCEPS IN O.I.L.A.

pelvis, and extraction is proceeded with as in case of occipito-pubic positions.

4. *Position O.I.L.T.*—Here it is impossible to grasp the head in the bi-parietal diameter. One of the parietal protuberances corresponding directly with the posterior portion of the pelvis (sacro-vertebral angle), the other to the anterior portion, that is to say, to the symphysis, it is not possible to apply the forceps symmetrically to the head. In case we try, on the other hand, to apply symmetrically to the pelvis, we will grasp the head in the occipito-frontal diameter, the greatest of the head. We aim, hence, to grasp the head in the diameter intermediate between the bi-parietal and the occipito-frontal. The left blade is again first introduced to the left and behind, on the left side of the occiput. The right blade, introduced the second, is first directed behind and to the right, and then brought spirally over the right frontal protuberance. The instrument, when locked, faces the left thigh of the mother. (Fig. 100.) The lesser curve is, therefore, again turned, although not exactly, towards the occiput. First, tractions are to be made downward, to bring the head to the pelvic floor, and it is then rotated from left to right, to bring the occiput under the pubes.

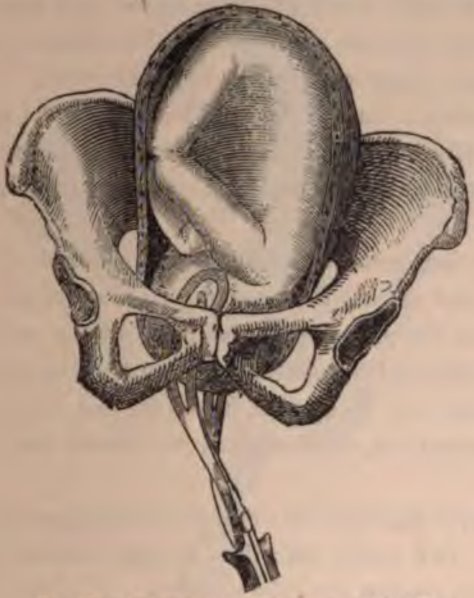


FIG. 100.—APPLICATION OF FORCEPS IN O.I.L.T.

5. *Position O.L.P.*—The occipito-frontal diameter lies in the right oblique of the pelvis. The occiput points to the left sacro-iliac synchondrosis, the forehead to the right cotyloid cavity. The bi-parietal diameter lies in the left oblique of the pelvis, the right side of the head is in front and to the left, the left side behind and to the right. Here again application is oblique.

The left blade necessarily occupying the left side of the pelvis, in order to be applied symmetrically to the head, must be placed at the extremity of the left oblique diameter, that is to say, in front and on the right side of the head. The right blade will be posterior, and should be inserted first, behind, on the left side of the head. Therefore, we will be obliged to cross the blades, unless we resort to Stoltz's method. The left blade, introduced the second, must be brought forward by the spiral movement of Mme. Lachapelle. If the head is well grasped, the lesser curve of the forceps will cross the forehead and be directed towards the right thigh of the mother.

The occiput being posterior, there are two methods of extraction: by Pajot's method, and extract the occiput posterior; or else, as we prefer, first pull the head down, and, once the head on the pelvic floor, rotate it from left to right, and from behind forward. The occiput under the pubes, the forceps will be applied inversely, and then, in multiparæ, we proceed to extract, or, in primiparæ, we remove the forceps and reapply it directly.

When the head is high up, the difficulty is sometimes great in bringing down the head. It is a good plan then to begin artificial rotation before the head has quite reached the inferior strait.

6. *Position O.R.A.*—The occipito-frontal diameter lies in the right of the pelvis; the right side of the head points backward and to the right, the left side forwards and to the left, the bi-parietal diameter being in the left oblique pelvic diameter. The forceps is applied symmetrically to the head, and oblique to the pelvis. The right blade, inserted first, is carried to the right side of the head, behind and to the right. The left blade is inserted second and to the left, and carried from behind forward, to the anterior extremity of the left oblique diameter of the pelvis, that is, on the left side of the head, in front and to the left, after Mme. Lachapelle's method. When locked, the lesser curve crosses the occiput, and points to the right thigh of the mother. At first traction is made

downward, and as soon as the head reaches the pelvic floor it is rotated from right to left to bring the occiput under the pubes. Since the right blade was inserted first, the blades must be crossed to lock, or else Stoltz's method used. The occiput under the pubes, the forceps is applied symmetrically to head and pelvis. Extraction is made as in the ordinary occipito-pubic position.

7. *Position O.I.R.T.*, The occipito-frontal diameter lies in the transverse of the pelvis. The forehead is to the left, the occiput to the right, the bi-parietal diameter is in the antero-posterior of the pelvis, the right side of the head is posterior, the left anterior. The forceps cannot be applied symmetrically to the head. The same is true of the pelvis, since the head would be seized in its longest diameter, O.F. We seek, hence, as in O.I.L.P., to grasp the head in a diameter between the bi-parietal and the occipito-frontal, and the head is seized irregularly. (Fig. 101.)

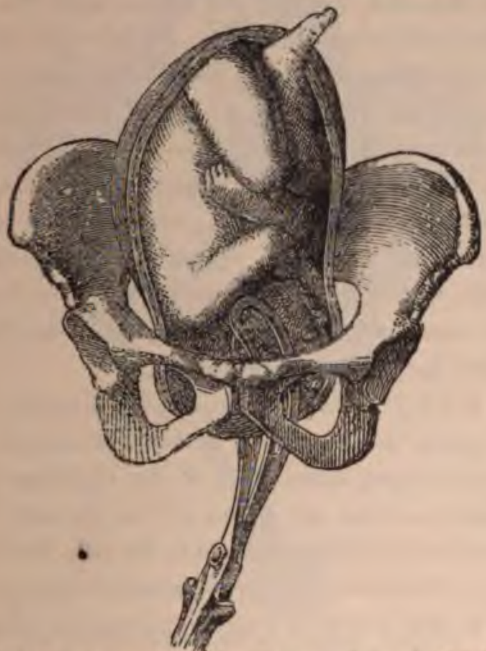


FIG. 101.—APPLICATION OF THE FORCEPS, POSITION O.I.R.T.

The right blade, inserted first, is placed behind and to the right, over the right lateral portion of the occipital bone, at the level of the right sacro-iliac synchondrosis. The left blade, inserted second, behind and to the left, is brought forward by the spiral movement behind the left cotyloid cavity, at the level of the left frontal protuberance. Here again, the blades must be crossed, or Stoltz's method used. The instrument once locked, has its lesser curve turned towards the right thigh of the woman, traction is made downward to bring the head to the pelvic floor, then it is rotated from right to left, and, the occiput once under the symphysis, we extract immediately in multiparæ, or else we remove the forceps in primiparæ, and make a direct application.

In Germany, Scanzoni, Zweifel, and others, apply the forceps differently. They place the left blade behind, on the right frontal protuberance, and the right blade, introduced second and underneath the left, is brought forward to the left lateral portion of the occipital bone. The forceps, therefore, is applied with its lesser curve, not to the occiput, but to the forehead, and directed towards the left thigh of the woman.

We much prefer our method which, when rotation has been made, allows us, in multiparæ at least, to extract without a new application of the forceps, while by the German method the forceps being in inverse application, we must re-apply it, or else bring the forehead to the pubes, and deliver the occiput posterior.

8. *Position O.I.R.P.*—The occipito-frontal diameter is in the left oblique of the pelvis, the bi-parietal in the right oblique. The occiput is behind and to the right, at the level of the right sacro-iliac synchondrosis, the forehead in front and to the left, at the left cotyloid cavity; the right side of the head is behind and to the left, the left side in front and to the right. The forceps is applied symmetrically to the head, and asymmetrically to the pelvis, an oblique application. The left blade is first introduced to the left and behind, on the right side of the head; the right blade, directed first behind, is brought forward, by the spiral movement, to the left side of the head. The lesser curve is applied to the forehead, and directed towards the left thigh of the mother, as in the position O.I.L.A. (Fig. 102.) Traction is made first downward, to bring the head to the perineum, and then rotation is made from right to left, to bring the occiput under the pubes. If rotation is impossible, we resort to Pajot's method, and when the forehead is under the symphysis, we extract the occiput posterior.

We see then that the rule, requiring the lesser curvature of the forceps to be directed towards the side of the head which we intend bringing under the pubes, is not absolute, is true, indeed, only when in posterior positions we wish to deliver the occiput posteriorly. Then it is towards the forehead that the lesser curve is placed; but when rotation is to be attempted, the forceps is applied according to rule, only in anterior positions. In fact, in the positions O.I.L.A and O.I.R.A., the lesser curve is directed towards the occiput, only in O.I.L.A., this curve points towards the left thigh, since the occiput is in front and to the left, while in O.I.R.A., it looks toward the right thigh, the occiput being in front and to the right.

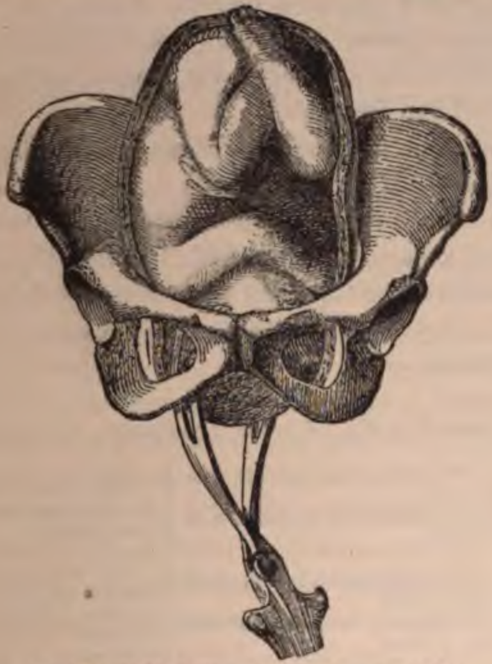


FIG. 102.—APPLICATION OF THE FORCEPS IN O.I.R.P.

In the positions O.I.L.P and O.I.R.P., on the contrary, the occiput is posterior, and the rule is not applicable, for if we wish the lesser curve to be directed at the outset towards the occiput, we would be obliged either to grasp the head irregularly, that is to say, from one frontal protuberance to the opposed portion of the occiput, as in transverse positions; or, if we wished to grasp the head regularly, we would have to apply the forceps with left blade to right, and right to left, which is inadmissible. The forceps, then, is applied as though the occiput were in front, and the lesser curve is at the forehead, pointing towards the right thigh in O.I.L.P., and towards the left in O.I.R.P. The head is then rotated and brought under the symphysis, and the forceps is in inverse application. In case of a multipara we at once deliver; in case of a primipara the blades are removed, and re-applied directly to the head.

If in a few words we resume the principles applicable to the placing of the blades: In anterior and transverse positions, the first is the posterior blade, and the second is applied over the occiput, occiput to left, left blade, to right, right blade. In posterior positions, the first blade behind, the second over the side opposed to the occiput, occiput to left, right blade, occiput to right, left blade.

The higher the head, the greater the necessity of bringing it down before attempting rotation. If we use Tarnier's instrument, never attempt rotation with the traction-rods alone, but unite the four branches (those of traction, those of prehension) in one hand, and then try. This, it will be remembered, is one of the objections we made to Tarnier's instrument.

The following table shows the different applications of the forceps in vertex presentations.

Table Resuming the Different Applications of the Forceps.

1, O.P.:	Left blade 1st, to left side of head. Right blade 2d, to right side of head.	The lesser curve grasps the occiput and is turned towards symphysis.
2. O.S.:	Left blade to left 1st, on right side of head. Right blade to right 2d, on left side of head.	The lesser curve toward symphysis, grasping forehead. Rotation. Re-application of the forceps, or delivery of occiput posterior.
3. O.I.L.A.:	Left blade to left 1st, and behind, to left side of head. Right blade to right 2d, and in front to right side of head.	Lesser curve toward left thigh of mother, and grasps occiput. Traction downward to engage head. Rotation from left to right. Delivery in O.P.
4. O.I.L.T.:	Left blade to left 1st, and behind, to left side of occipital bone. Right blade to right 2d, and in front, on the right frontal protuberance.	Lesser curve to mother's left thigh. Head grasped irregularly Downward traction to engage head. Rotation from left to right. Delivery in O.P.
5. O.I.L.P.:	Left blade 1st and behind, to left side of head. Right blade 2d and in front, to right side of head.	Lesser curve to right thigh, and grasping forehead. Crossing or Stoltz's method. Traction, then rotation left to right. Re-application of blades to deliver in O.P., or else method of Pajot and extraction in O.S

6. O.I.R.A.:	Right blade to right 1st and behind, to right side of head. Left blade to left 2d and in front, to left side of head.	Lesser curve to right thigh and grasping occiput. Crossing, or Stoltz's method. Traction downward, rotation from right to left, extraction in O.P.
7. O.I.R.T.:	Right blade to right. 1st and behind, to right side of occipital bone. Left blade to left 2d and in front, on left frontal protuberance.	Lesser curve to right thigh. Head irregularly grasped. Traction downward, rotation from right to left. Crossing or Stoltz's method.
8. O.I.R.P.:	Left blade to left 1st and behind, on right side of head. Right blade to right 2d and in front, on left side of head.	Lesser curve to left thigh and grasps forehead. Downward traction. Rotation right to left. Re-application of blades to extract in O.P., or Pajot's method and extraction occiput posterior.
	Positions O.I.L.A. and O.I.L.T.: Left blade behind and to left 1st. Positions O.I.R.A. and O.I.R.T.: Right blade behind and to right 1st.	Blade of same name as side where occiput lies.
	Position O.I.L.P.: Right blade to right and behind 1st. Position O.I.R.P.: Left blade to left and behind 1st.	Blade of opposite name to side where occiput lies.

B. *The Head is only partially engaged at the Superior Strait.*—In this case the obstacle to the engagement of the head is usually due to a contraction of the pelvis or to prolapse of a fœtal part. The head is almost always transverse; direct anterior and posterior positions are not possible. The oblique may be met with when the contraction is moderate, and the head not very large. The transverse position is the rule, and it is hence usually impossible to grasp the head regularly; and to endeavor to apply the forceps, according to the German method, parallel to the pelvis, is to grasp the head from occiput to pubes, and consequently to increase the obstacle. We must, therefore, act as in transverse positions with the head in the cavity, seize the head by one frontal protuberance and the opposed side of the occiput.

The choice of the anterior and the posterior blades is here again subordinated to the side where the occiput lies.

In the position O.I.L.T., the head is grasped between the posterior portion of the occipital bone and the anterior portion of the forehead; the left blade is inserted first, to the left, and applied to the left portion of the occiput, the right blade is inserted second, to the right and behind, then brought forward by the spiral movement over the right frontal protuberance. The lesser curve is directed towards the left thigh of the mother. The head is grasped irregularly. At the outset traction is made downwards, rotation occurs from left to right, and extraction with the occiput to the pubes.

In the position O.I.R.T., the right blade is inserted first, behind and to the right, over the right side of the occipital bone; the left blade, inserted second and behind, is brought forward over the left frontal protuberance. We must, therefore, either cross the blades, or else use Stoltz's method. When the forceps is locked, the lesser curve points to the mother's right thigh; the head is grasped irregularly. Traction is first made downward, to engage the head, and to bring it down as far as is possible, then it is rotated from right to left, and extracted with the occiput to the pubes.

The capital point, in order to thoroughly grasp the head, is to introduce the blades deeply enough. In such cases the pivot of the instrument is almost at the vulva. The hand, then, which is to guide the blade, must be passed deeply between the head and the cervix to protect the maternal parts, and the head must be steadied from the outside by an assistant, when the blades are being placed, for it tends to escape above the brim.

Traction must be made in the axis of the pelvis, and this, as all authorities agree, is the true difficulty. To remedy it, Pajot devised his method, and Hubert, Fabri, Moralés devised the perineal curve of the forceps, which Tarnier himself adopted in his first model.

Tarnier tries to solve the problem by placing the woman on the side, in order to be able to make traction as far back as possible without being inconvenienced by the side of the bed, and he makes the woman resume the dorsal position as soon as the head has reached the cavity. But it is not only the border of the bed which is in the way, but the perineum itself, against which the blades press as soon as the forceps is carried enough backwards. Now, if it is difficult, if not impossible, to carry the classic forceps far enough back, it is even more so Tarnier's, the indicator needle of which is made to tell us the direction in which traction must be made. In these cases, the indicator calls for that which is impossible, for we cannot make traction far enough back, and it is only, indeed, when the head is below the superior strait that the indicator can give real indications, for then we can fulfill them. Such an ardent advocate of Tarnier's forceps as is Pinard, is obliged to admit that, in oblique applications, the head being above the superior strait, traction by means of the instrument is not perfect, for the perineum interferes with its being placed in the pelvic axis occupied by the head.

Now this is one of the marked advantages of Pajot's method. It is said that, in this method, the forceps does not act as a tractor, but as a lever. Of what use, however, here mathematical rules, which are at the best simply problematical, since the pelvic axis changes with each woman, according to the form, dimensions, and deformities of the pelvis? The main point is to make the head descend with the least damage to mother and to child. Whether, then, the forceps acts as tractor or as lever, the best method is that which permits the head to pass easily and rapidly through the superior strait, and it is admitted that in many cases this is possible by Pajot's method, where simple tractions fail. Further, in these cases, the lateral movements, carefully made, are of great utility.

In these instances, therefore, we prefer the classic forceps, and if traction downward and backward do not suffice, we try Pajot's method, and the head once at the inferior strait, we try artificial rotation, ready, if this fail, to deliver the occiput posterior.

If, notwithstanding these methods, we fail in dislodging the head, then, in the interests of the mother, we must sacrifice the child, and it is preferable to do this, and give to the mother greater chances of health, than to endeavor at all hazards to make the head descend; for, on the one hand, the injuries to the mother compromise greatly the puerperium, and, on the other hand, granting that the child is born alive, the lesions resulting from exaggerated traction and compression almost fatally mean its death in from twenty-four to forty-eight hours after birth.

C. *Head movable above the Superior Strait.*—Most authorities here prefer version to the forceps, whenever possible. But it has been proved by the researches of Budin, Milne, Goodell and Champetier, that although version is preferable to forceps in pelvic deformity before term, it is not so at term.

The causes which ordinarily retain the head above the superior strait may be reduced to two: oblique positions of the head, and pronounced pelvic contraction. The first, we have seen, almost always correct themselves in course of time, if the pelvis is normal, and the accoucheur has simply to wait. If, on the other hand, we are dealing with great pelvic contraction, it is not forceps which we must use, but perforation, or cephalotripsy, or the Cæsarean section, [or better still, in suitable cases, laparo-elytrotomy.—Ed.]

There remain then for consideration the cases of considerable contraction, where we can hope to deliver the child at term without mutilation. The application of the forceps then becomes very difficult and delicate. Aside from the fact that the mobility of the head makes it difficult to apply the blades, the hand cannot be inserted far enough to guide them. We must first, then, make one or two efforts at traction to be sure that the head is grasped firmly, for above all we must take precautions against the instrument slipping. Sometimes the head is grasped too far in front, and it escapes from the forceps behind, or inversely, with the first tractions. Altogether, indeed, the accoucheur is not at liberty to do as he would wish; he must do the best he can; and if he is fortunate enough to grasp the head firmly, if after a few sustained tractions the head does not budge, it is advisable to perforate, or to resort to cephalotripsy.

APPLICATIONS OF THE FORCEPS IN FACE PRESENTATIONS.

The face, even as the vertex, may lie at the level of the inferior strait, in the cavity, at the superior strait, above it. Usually, in each of these instances, the head is diagonal or transverse. The antero-posterior diameter of the pelvis is too small for the occipito-mental, and therefore a mento-sacral position, properly so-called, does not exist, and the same is true of the mento-pubic. We may have a mento-sub-pubic position—that is to say, rotation has been affected, and the chin is under the pubes. Direct application of the forceps is exceptional in face presentations, and it is usually the oblique which is practised.

The general and special rules are the same as for the vertex; two conditions, however, lead all the others:

1. The instrument must be applied to the sides of the face, to avoid wounding it anteriorly, or the neck. Occasionally, as we will see, we have no choice in this matter.

2. The *absolute* necessity of making the face rotate, in order to bring the chin under the symphysis. Indeed this rotation may alone allow us to terminate labor without mutilating the fœtus.

In these instances, more even than in case of the vertex, the hand must be introduced deeply to protect the maternal and the fœtal parts. The chin must always be brought under the symphysis, because transformation into the vertex is only possible when the position of the face is frontal, or when it is above the superior strait. In the first we must wait, for this transformation may occur spontaneously; in the second, it is version to which we should resort, and not to the forceps.

We must never forget that in face presentations labor is always prolonged, and that, therefore, we must have plenty of patience.

Pinard advocates placing the blades nearer to the chin than to the brow, ready to remove them, and re-apply as soon as the chin has been brought down. This is good advice, but although easy of performance on the manikin, it is far from being so on the living female. The great difficulty in face presentations is to apply the forceps to the sides of the face, and while this is possible when the head is in the cavity, it is not so when the face is still elevated. Usually we must be content with grasping the head obliquely, from one frontal protuberance to the maxillary angle.

We must remember, further, that transverse presentations of the face are relatively frequent compared to the others, and that in such cases we are obliged to grasp the head obliquely as in transverse presentations of the vertex, the very situation of the face preventing its being seized laterally.

All the authorities agree in regard to the difficulties of application and of delivery in face presentations. The chin must not only be brought down, but it must, as well, be brought forward; the face must not only be brought down, but it must, in particular, be rotated in order to bring the chin under the symphysis. Often all our efforts fail and we are obliged to mutilate the fœtus. The greater the reason for this, if, as not infrequently happens, with the face presentation there is prolapse of a fœtal part.

A. *The Face is in the Cavity, having passed through the superior Strait.*

1. *Mento-pubic, or, better, mento-sub-pubic.*—The forceps is applied directly, the chin being under the symphysis and the forehead in the pelvic curve; that is to say, the fronto-mental diameter lies in the antero-posterior of the pelvis. The bi-malar diameter is in the transverse of the pelvis. The left blade is inserted first to the left on the right side of the face, the right blade second to the right on the left side of the face, the

lesser curve pointing towards the symphysis. It will be sufficient to gently lift up the forceps, and the head will appear, in succession, by its sub-mento-frontal, sub-mento-bregmatic, sub-mento-occipital diameters. (Fig. 103.)

2. *Mento-sacral Position.*—Is purely theoretical, and does not exist in practice, the chin being always to the right or to the left, towards one of the sacro-iliac synchondroses, and the position thus really is *mento-posterior* (*right or left*).

3. *Position M.I.L.A.*—The position of the head is diagonal, the mento-frontal diameter lies in the left oblique of the pelvis, the forehead points towards the right sacro-iliac symphysis, the chin towards the left cotyloid cavity. The left side of the head is forward and to the right, the right side backward and to the left. The bi-malar diameter is in the right oblique of the pelvis. The face may be grasped laterally, but one of the blades will be in front and the other behind. The forceps will be applied symmetrically to the head, and asymmetrically to the pelvis. The left blade, first inserted, will lie to the left and behind, over the right malar region; the right blade will be inserted to the right and behind, and then brought spirally forward over the left malar region. The lesser curve will point towards the left maternal thigh. First, tractions must be made downwards to lower the chin, then rotation is made from left to right to bring the chin under the symphysis, and extraction follows, chin to the pubes. (Fig. 104.)

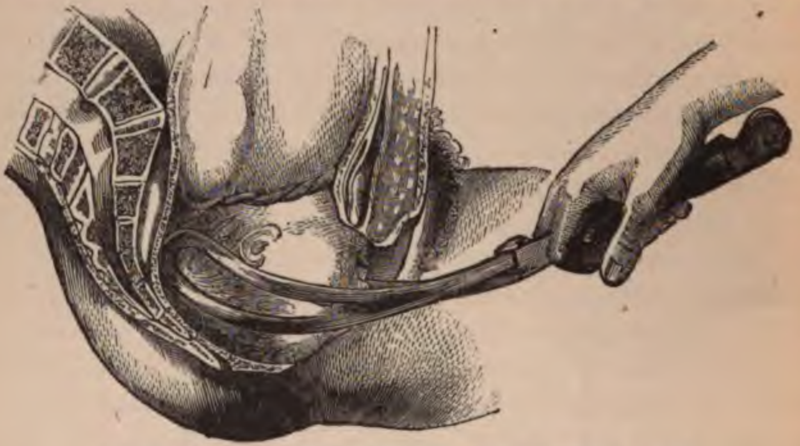


FIG. 103.—APPLICATION OF THE FORCEPS MENTO-SUB-PUBIC POSITION.

4. *Position M.I.L.T.*—The head is transverse, the fronto-mental diameter in the transverse of the pelvis, the bi-malar in the antero-posterior. The left side of the head is in front, the right side to the rear. The head cannot be exactly seized laterally, and we cannot apply the forceps to the sides of the pelvis, after the German method, since the head would be grasped from chin to forehead, which would expose the fœtal neck to great injury. The head, hence, must be seized irregularly, from one frontal protuberance to the maxillary angle. The left blade is first inserted to the left and posteriorly, as far as possible near the end of the bi-malar diameter; the right blade, inserted second, to the right and behind, then brought forward, by the spiral movement, over the left frontal protuberance. The lesser curve is towards the mother's left thigh. Traction is made downward, the chin thus lowered, the face is rotated, and it is extracted, chin to the pubes.

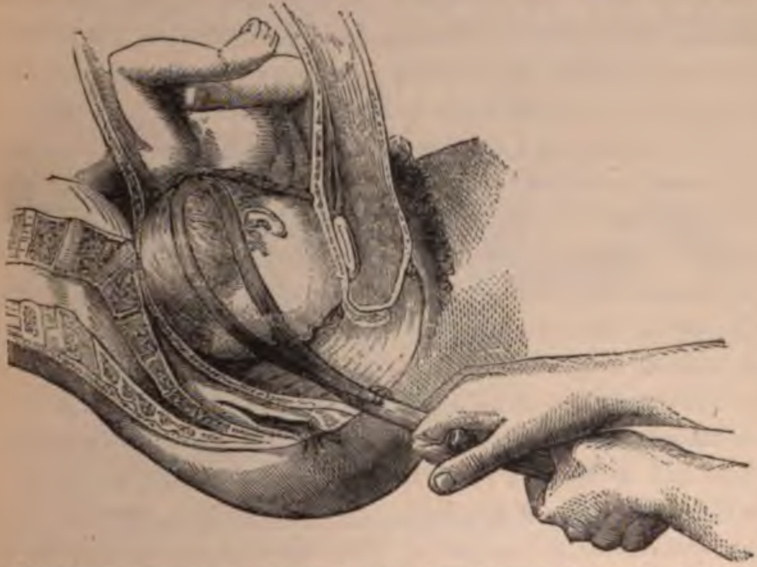


FIG. 104.—APPLICATION OF THE FORCEPS IN FACE PRESENTATIONS. Head in the Cavity. Rotation has occurred.

5. *Position M.I.L.P.*—The fronto-mental diameter is in the right oblique of the pelvis, the bi-malar in the left oblique. The left side of head is to the left, and the right to the right of the pelvis. The forceps must be applied as though we intended bringing the forehead to the symphysis. The posterior blade will be the right, and is applied, first, behind

and to the right over the right side of the face, then the left blade, second, is inserted behind and to the left, and brought forward over the left side of the face. The lesser curve points towards the right thigh of the mother. Before locking, the blades must be crossed, or else Stoltz's method used. The application is oblique. Traction at first is downward and backward to lower the chin before rotation. But even as we saw in vertex presentations in case of the occiput posterior, so in face it is difficult to bring it down when high up. It is not possible to make traction far enough backwards. Danyau has advised applying the blades inversely, in order to make traction sufficiently backward. Aside from the fact that this recommendation is extremely difficult to follow, and contrary to all rule, the method has not given good results even in the master-hands of Danyau. It is better hence to apply the blades as we have advised, and to pull as far backward and downward as is possible. The chin once lowered, rotate, and then remove the forceps, and re-apply *directly*, and deliver with chin to the pubes. If the difficulty is very great, it is better to mutilate the fœtus than to expose the mother to great injury.

6. *Position M.I.R.A.*—The fronto-mental diameter is in the left oblique of the pelvis, the bi-malar in the right oblique. The right side of the face is to the left and forwards, the left side to the right and backwards. The right blade is inserted first, behind and to the right, and is placed over the left lateral side of the face. The left blade is inserted second, behind and to the left, and is brought forward spirally, and placed over the right lateral side of the face. The application is symmetrical to the head, and oblique to the pelvis. The lesser curve points to the right thigh of the mother. The blades must be crossed, or Stoltz's method used. Traction is made downward to depress the chin, and then rotation from right to left, to bring it under the symphysis. Extraction, chin to the pubes.

7. *Position M.I.R.T.*—Face is transverse in the pelvis. The fronto-mental diameter is in the transverse of the pelvis, the bi-malar in the antero-posterior. The left side of the face looks directly backward, and the right forwards. The face cannot be seized regularly, and we try to grasp it as far as possible in the bi-malar diameter. The right blade is inserted first, behind and to the right, over the left maxillary angle, the left blade, second, behind, is brought forward spirally and placed over the right frontal protuberance. The lesser curve is towards the mother's

right thigh. Crossing, or Stoltz's method, is necessary. Traction downward to bring down the face and chin rotation from right to left, extraction with chin to pubes.

8. *Position M.I.R.P.*—The fronto-mental diameter points by the chin to the right sacro-iliac synchondrosis, by the forehead to the left cotyloid cavity. The right side of face is forwards and to the right, the left side behind and to the left, the bi-malar diameter is in the right oblique of the pelvis. The forceps is symmetrical to head, and oblique to pelvis. The left blade is inserted first, behind and to the left, on the left lateral side of the face; the right blade, second, behind and to the right, and then is brought forward spirally over the right lateral side of the face.

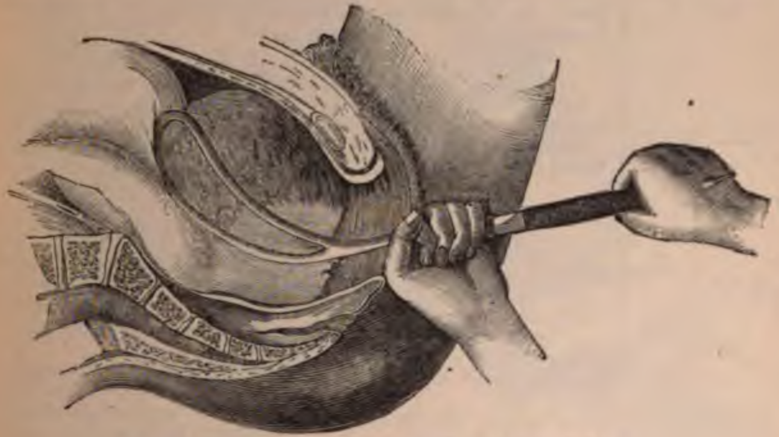


FIG. 105.—APPLICATION OF THE FORCEPS TO FACE IN M.I.R.P.

(Fig. 105.) The lesser curve is over the forehead towards the left thigh of the mother. Traction downwards, rotation from right to left, re-application of the blades, and extraction, chin to the pubes. The difficulties are the same as in M.I.L.P.

We see, therefore, that the special rules for the forceps in face presentations are identical with those applicable to the vertex.

In anterior and transverse presentations: First blade behind, second blade to side where the chin points.

In posterior presentations: First blade behind, and to the side opposed to the position of chin.

In the following table are resumed the rules applicable to the forceps in face presentations:

Rules Applicable to Forceps in Face Presentations.

1. Mento-pubic	Left blade to left and 1st, on right side of face. Right blade to right and 2d, on left side of face.	Direct application. Lesser curve towards Symphysis. Extraction, by lifting the handles, in S.M.F., S.M.B., S.M.O.
2. Mento-sacral	Practically does not exist. Transformed always into M.I.L.P or M.I.R.P.	
3. M.I.L.A.	Left blade to left, 1st, behind, on right side of face. Right blade to right, 2d, in front, on left side of face.	Oblique application. Lesser curve towards mother's left thigh. Traction downward. Rotation from left to right. Extraction in M.P.
4. M.I.L.T.	Left blade to left, 1st, behind, on right maxillary angle. Right blade to right, 2d, in front, on left frontal protuberance.	Head irregularly grasped. Lesser curve towards left thigh Downward traction. Rotation from left to right. Extraction in M. P. Danger of slipping.
5. M.I.L.P.	Right blade to right, 1st, behind, to right side of face. Left blade to left, 2d, in front, to left side of face.	Forceps symmetrical to head, oblique to pelvis. Lesser curve to right thigh. Crossing or Stoltz's method. Rotation from left to right. Extraction in M. P. Perhaps mutilation. Reapplication of blades after rotation.
6. M.I.R.A.	Right blade, 1st, behind, to left side of face. Left blade, 2d, in front, to right side of face.	Oblique application. Lesser curve to right thigh. Crossing or Stoltz's method. Downward traction. Rotation from right to left. Extraction in M.P.
7. M.I.R.T.	Right blade, right, 1st, behind, over left maxillary angle. Left blade, left, 2d, in front over right frontal protuberance.	Irregular grasp. Lesser curve to right thigh. Crossing or Stoltz. Downward traction. Rotation right to left. Extraction in M.P.
8. M.I.R.P.	Left blade, left, 1st, behind, to left side of head. Right blade, right, 2d, in front, to right side of head.	Symmetrical to face, oblique to pelvis. Lesser curve towards mother's left thigh. Traction downwards. Rotation from right to left. Reapplication of blades. Extraction in M.P. Perhaps mutilation.
Positions M.I.L.A. and M.I.L.T.	Left blade, 1st, left, behind. Right blade, 2d, right, in front.	Blade corresponding to side where chin points, 1st and behind. Chin to left, left blade; chin to right, right blade.
Positions M.I.R.A. and M.I.R.T.	Right blade, 1st, right, behind. Left blade, 2d, left, in front.	
Position M.I.L.P.	Right blade, right, 1st, behind. Left blade, left, 2d, in front.	Blade opposed to side where chin points, 1st and behind. Chin to left, right blade; chin to right, left blade.
Position M.I.R.P.	Left blade, left, 1st, behind. Right blade, right, 2d, in front.	

B. *The Forceps to the After-coming Head.*

Without going as far as Mme. Lachapelle, Chailly and Pajot, who say that when, the body having been delivered, we cannot extract the head, it is because the method employed is not a good one, or the force employed not sufficient, and that the hand ought to complete labor; we must, in general, admit that the cases requiring the forceps are, if not exceptional, at least relatively rare. They tend to become rarer still, since Tarnier and his pupils have shown the utility of pressure exercised from above below through the abdominal walls on the head at the superior strait. Champetier de Ribes, in particular, has insisted on this, and he has shown that pressure on the forehead from above, combined with traction in the inferior maxilla, will often certainly cause the descent of the head, even where the pelvis is contracted, with surprising ease. Nevertheless, in infrequent cases, the forceps is indispensable, and we dwell on it briefly.

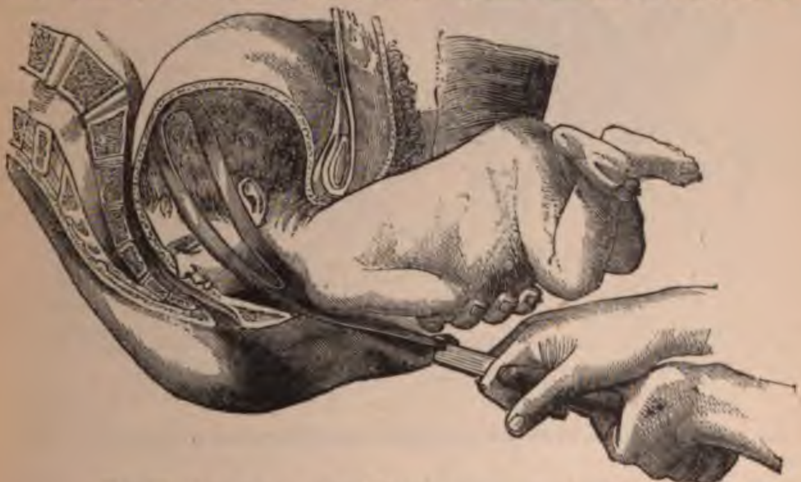


FIG. 106.—APPLICATION OF THE FORCEPS TO THE AFTER-COMING HEAD.

In 1874 and 1875 Grynfeltt, adjunct at Montpelier, studied this question. After having shown that Chailly, Cazeaux, Tarnier and Barnes are not opposed to the method, and that Busch, Rigby, Meigs, are greatly in favor of it, he endeavors to prove that, contrarywise to the opinion in France and abroad, the forceps should always be applied underneath the sternal plane of the fœtus, (Fig. 106), and exceptionally only above the dorsal plane.

After delivery of the body, the head may be retained at the superior strait, in the cavity, at the inferior strait.

I. *Head in the Inferior Strait, or in the Cavity.* a. *Occipito-pubic Position.*—Rarely requires the forceps, but when used it must be applied so as to lower the chin to the perineum, and then extract, the mouth, nose, brow, bregma, and vertex, appearing successively. In a word, the head must be flexed.

To seek the face in the sacral excavation, the best plan is to lift the body forward towards the mother's belly, and to insert the blades below it on the anterior or sternal plane. To extract, the handles are progressively lifted, and traction made.

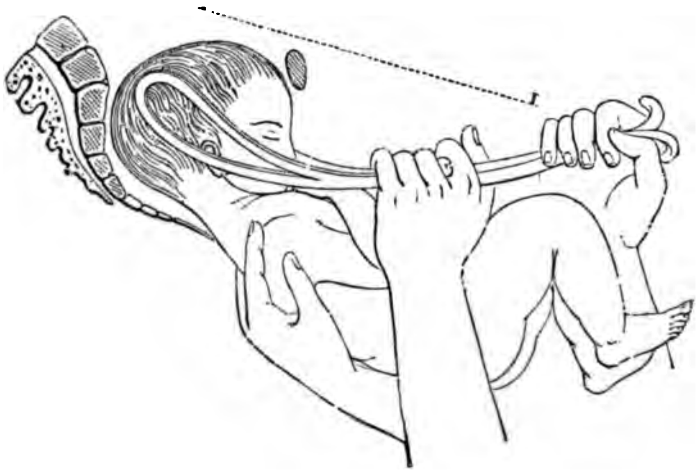


FIG. 107.—THE FORCEPS TO AFTER-COMING HEAD. Head flexed and in occipito-sacral position.

b. *Occipito-sacral Position.*—The head may be flexed or extended.

1. *Head flexed.*—The body of the fœtus must be pulled downward, the forceps blades introduced above. The handles are then carried downward and backward to increase flexion, and deliver the occiput over the perineum. (Fig. 107.)

2. *Head extended.*—The chin is in front and high up, behind the symphysis. The body must be lifted above, the blades inserted below the fœtal body, and carry the handles upwards to deliver *belly to belly.* (Fig. 108.)

c. *Oblique Positions.*—Make forward rotation if possible, and, according as the head is flexed or extended, deliver in O.P or in O.S. The blades, hence, are applied according to the case, above or below the fœtal body.

d. *Transverse Positions.*—The head is grasped irregularly, and this is the only difference in the manœuvre.

In this case Grynfeltt advises rotation by the hand, or by a single blade of the forceps acting as a lever.

II. *Head at Superior Strait.*—Usually Champetier de Ribes' method, described above, answers here—the infant, however, ordinarily dies. It is not the forceps, then, which should be used, but cranioclasty or cephalotripsy. Certain authors advise decapitation, and then forceps to the head in the uterus.

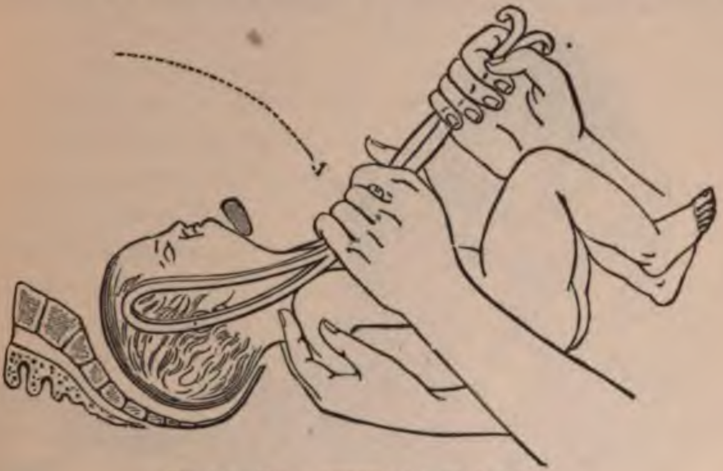


FIG. 108.—HEAD POSTERIOR AND EXTENDED.

III. *Head after Decapitation.*—The head must be fixed at the superior strait by an assistant, and then the entire hand in the uterus places the head in the most favorable situation, and the blades are applied to the sides of the head. The operation is very difficult. Happily, the hand alone suffices usually to extract the head.

C. *Forceps to the Breech.*

If the child is dead, the blades are applied, after the German fashion, at the sides of the pelvis. But if the child is alive, the breech must be grasped in its bi-iliac or bi-trochanteric diameter. Exaggerated compression must be avoided, and, therefore, the blades often slip. We must, hence make traction gently. Tarnier's forceps, not allowing variation in compression, is, according to his pupils, more advantageous than the classic. (Fig. 109.)

[The following pages are inserted here instead of later on, as in the original, because here they are in natural sequence, and Charpentier would have done so, he tells us, had Olivier's thesis on the subject appeared in time to have allowed him.—Ed.]

This subject has been studied in detail by Budin, Pinard, Cantacuzène, Lefour and Olivier. Budin has, in particular, insisted on the fact that in a greater number of cases than is generally believed—we have ourselves observed three cases—the pelvic extremity is far more engaged than is generally stated, and that this deep engagement is met with exclusively in case of the decomposed breech. Palpation and touch suggest a cephalic presentation, and it is only when the woman assumes the lateral, or, if need be, knee-chest position, that we obtain the cephalic ballotement which is characteristic of a breech presentation. As for the touch, it is only by carrying the finger high up into the posterior *cul-de-sac*, and thus exploring carefully the fœtal presenting part, that we correct the error in diagnosis of cephalic presentation.

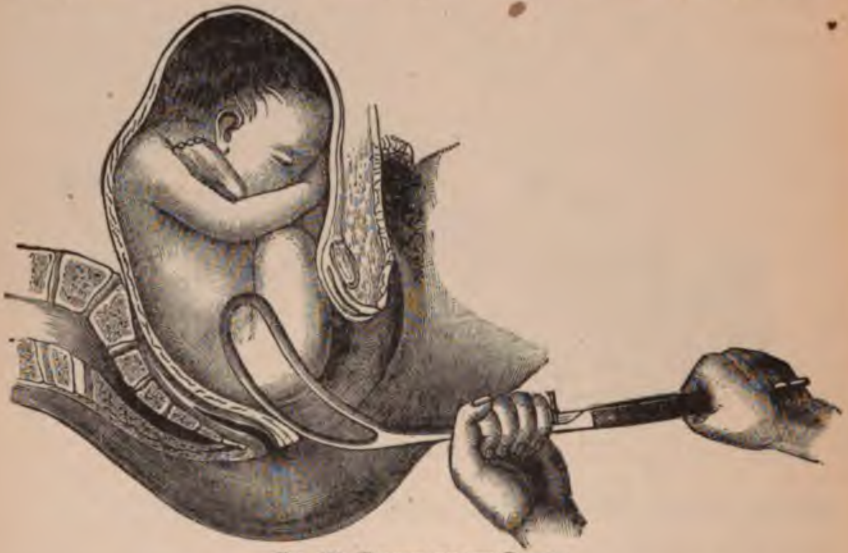


FIG. 109.—FORCEPS TO THE BREECH.

Lefour and Olivier look at the matter from a different standpoint. Both recalling the fact that breech presentations usually call for intervention, and that this interference, whether manual or instrumental, is dangerous for the infant, have endeavored to find out not only the causes which render descent and expulsion difficult, but the instances in which intervention is most dangerous, and both have proposed different methods.

While Lefour rejects the forceps, except when the infant is dead, Olivier, on the strength of experiments made on the manikin, and clinically, advises strongly the forceps, but applied after a peculiar manner. Lefour counsels as follows: During pregnancy to beware of version by external manipulations, and to await the onset of labor. During labor to retain the membranes as long as possible, to wait until the cervix is dilated or dilatable, and then to introduce boldly the hand into the uterus and bring down one or two feet; in a word, to transform the breech into a foot presentation, and to deliver accordingly. If the membranes have ruptured prematurely, and the os is neither dilated nor dilatable, to wait for deep engagement of the breech. When the anterior hip is under the symphysis, and labor cannot be completed, because the posterior hip cannot pass the perineum, he rejects the finger, the blunt hook, the forceps, except where the infant is dead, and advises the following method, which is none other than that of Ritgen, for delivering the head under the symphysis by extending it: He inserts the index and the middle finger, or the index alone, into the anus of the parturient, the pulp directed upwards, and he pushes on the thigh which is hooked and stopped by the perineum. The finger of the other hand may assist by making traction upward and forwards from the anterior groin.

Olivier, on the other hand, is a resolute partisan of the forceps, and concludes from his experience: The instrument is not only advantageous, but is inoffensive to the fœtus, if it is applied, not as is ordinarily recommended to the iliac crests, but to the fœtal limbs, and differently according to whether the position is anterior or posterior.

If we use a filet, aside from the difficulty of placing it, we run the risk of fracturing the femur when making traction, and especially in posterior positions.

"In anterior positions, that is to say, when the fœtal sacrum is towards the right or left pectineal eminence, or the symphysis, the limbs, extended along the abdomen, make with the filet, the woman in the dorsal position, an angle the apex of which looks backward. If now we make traction in the axis of the groin we will not fracture the femur, because the greatest traction is at the most resisting part of the bone, the neck, the reverse of what holds in the adult, especially the aged.

"In posterior positions, on the contrary, when the sacrum is towards the right or the left sacro-iliac synchondrosis, the legs form with the fœtal ventral surface an angle, the apex of which looks almost directly upward. This is strictly true, only when the breech is at the inferior strait. Traction made with the filet must be perpendicular to the leg, and it is apparent why fracture is likely. This is produced when the limb descends and it then becomes perpendicular to the tractor, especially since, coincidently with the descent of the leg, the pelvis rises. Therefore, Olivier advises, during traction, to apply the fingers of the free hand to the sacrum, and by pushing the breech forward prevent its rising, and the extension of the leg."

As for the forceps, Olivier, basing his opinion on the experiments of Jacquemier, Balochi, and on the clinical data of Stoltz, Tarnier, Depaul and others, claims that it is, in the vast majority of cases, inoffensive to the child, although the instrument slips. The cause of this slipping, in his opinion, depends either on the fact that the handles are not compressed, or else that the blades are applied to the iliac crests instead of on the fœtal limbs. The pelvis, he says, offers an insufficient hold, because "when we compress the iliac crests, the bi-iliac diameter diminishes, and the crests shrink, and therefore a firm hold is not possible. But the limbs, close together, make a cone with base downward, and apex above. The diameter of the base is the bi-trochanteric. If the forceps is applied here, the blades may slip a little, but they are stopped by the increasing volume of the cone. We thus have a firm hold, and expose the child to less risk."

"Olivier has determined that: 1. The forceps may be applied to the limbs. 2. The hold is firm. 3. No lesion is produced.

"The application of the forceps to the limbs is easy. Is it applied as well in every position? With Tarnier's forceps, thanks to the curve, which is the same as that of Levret, when the position is posterior, S.I.L.P. or S.I.R.P., the blades adapt themselves well to the limbs in the bi-trochanteric diameter, and the forceps cannot slip, or only a trifle, owing to the increase in the cone downwards. When, however, the fœtus is in one of the anterior positions, S.I.R.A. or S.I.L.A., the blades do not adapt themselves as well, although the bi-trochanteric diameter is firmly grasped, for the extremity of the blades extends beyond the anterior surface of the limb, and compresses the abdominal walls, and the hold is less firm. This is why in the majority of our experiments, made with the fœtus in anterior positions, the forceps has begun to slip before bringing down the breech.

"The breech does not come down until the ends of the blades have reached the groin. There they meet the bi-trochanteric diameter, and they can slip no further. The recognition of this fact explains why, in certain cases where, when it only remained to extract the posterior hip, we have endeavored to do this with the forceps, carrying it above and forwards, it has unlocked. In thus carrying the forceps the extremity of the anterior blade is brought into the groin, and, the breech not descending at once, the extremity of the posterior blade passes beyond the bi-trochanteric diameter, and the instrument slips."

Hence, in anterior positions, Olivier recommends the forceps which Trélat has constructed for extracting the breech, but he rejects it for the posterior positions, where, he thinks, the Tarnier forceps is the best, and in none of his experiments did he injure the pelvis or the fœtal limbs.

Finally Olivier draws the following conclusions:

1. *During Pregnancy.*—The breech is engaged, or not. When engaged, no interference; when not engaged, version by external manipulations, and, in case of success, application of a binder, to be worn till labor.

2. *During Labor.*—A. The breech at the superior strait. B. The breech more or less engaged. C. The breech at the vulva.

A. If the membranes are unruptured, when dilatation is complete, rupture them, bring down a foot and wait; if the cord prolapses, if it is compressed, if after an interval the breech does not engage, extract. If the membranes are ruptured, and intervention is called for, try to bring down a foot, and, in case of success, extract; if this fails, apply the forceps; if it slips, extract by a filet in the groin. *The forceps should be applied as far as possible to the limbs, and not to the pelvis.*

B. In anterior positions apply the forceps according to the above rules; if it slips, re-apply; in case it slips again, extract by a filet passed around the anterior groin.

In posterior positions, apply the forceps; if it slips twice in succession, and this is very exceptional, extract by the filet and use the complementary manœuvre of Lefour, finger in parturient's anus.

In transverse positions extract by a filet in anterior groin. One application of forceps might succeed.

When the infant is dead, if the preceding manœuvres do not succeed, resort to the cephalotribe or the cranioclast, or any other instrument which will hold well.

C. Resort to the method Ritgen devised for the vertex, and, if this fail, the bi-rectal of Lefour. Act with great care.

The results of these experiments are: The forceps may be of great utility in breech presentations, but it should be applied to the limbs and not to the fœtal pelvis. It is often inefficient, and we have to resort to the filet.

We have no change to make, then, in the opinion expressed under the subject of labor in pelvic presentations. Wait as long as possible; then, in case of absolute necessity, resort to the forceps and to the filet, in accordance with the rules laid down by Olivier.

FREQUENCY OF THE APPLICATION OF THE FORCEPS.

It is nearly impossible to give exact statistics, for the frequency varies with the accoucheur and with the country.

At the Paris Clinic from 1852 *to* 1880.

Number of Applications.		Mothers		Infants.		Total No. Labors.	Mortality.	
Simple.	Complicated by tumors, etc.	Living.	Dead.	Living.	Dead.		Mother.	Infant.
358	226	500	84	445	132	21,615	14.48%	23.80%

The result for 7 infants is not noted. Thus we find about one application in 37 labors taken indifferently.

At the Maternité of Paris (from Pinard) from 1848 *to* 1877.

Total number of Labors.	Number of Applications of Forceps.	
	Normal Pelvis.	Contracted Pelvis.
55,355	541, or 1 in 97	163, or 1 in 275.3

Ploss has given us the most complete statistics of the German and English hospitals. The following tables are taken from him :

German, Russian and Swiss Maternities and Clinics.

Name of Operator.	Period.	Number of Applications.	Total Number of Labors.	Proportion: One Application to
Osiander (Gottingen)	1792–1822	1,016	2,540	291 labors.
Boer (Vienna)	1789–1822	119	39,390	250 "
D'Outrepont (Salsburg)	1804–1815	3	518	175 "
Richter (Moscow)	1801–1807	15	2,511	172 "
Bartsch (Vienna)	1847–1849	45	6,608	146 "
Sidorowictz	1822–1825	6	838	139 "
Jungmann (Prague)	1811–1827	120	12,134	102 "
Weidmann, Leydig and Pizzola (Mayence)	1806–1848	79	7,739	98 "
Schilling (Bamberg)	1818–1821	4	309	77 "
Roederer (Göttingen)	1751–1762	3	225	75 "
Die (Moscow)	1860–1862	19	1,387	73 "
Bartsch, Frank	1833–1841	61	4,425	72 "
Flugel (Bamberg)	1819–1847	65	4,122	63 "
C. Braun and Bartsch (Vienna)	1857–1859	413	25,181	61 "
Birnbaum (Cologne)	1860–1863	21	1,274	60 "
C. Braun and Spaeth	1860–1865	770	42,040	109 "
Klein and Bartsch	1843	111	5,792	52 "
Martin (Munich)	1858–1860	50	2,497	49 "
André (Breslau)	1821–1826	7	349	49 "
Klein (Vienna)	1827–1843	730	35,417	48 "
Martin (Munich)	1814–1822	48	2,251	47 "
Klein and Bartsch (Vienna)	1854–1856	485	22,293	46 "
Kustner (Breslau)	1827–1828	8	367	46 "
Hecker (Munich)	1860–1867	131	5,945	45 "
Adelmann (Fulde)	1836–1838	4	136	40 "
Ranier (Landshut)	1824–1826	8	289	36 "
Spiegelberg (Freiburg)	1861–1862	8	281	35 "
Richard, Tom, (Innsbruck)	1824–1853	46	1,400	35 "
Michaelis (Kiel)	1839–1846	29	1,000	35 "
Valenta (Leyback)	1857–1858	8	273	34 "
Hofmann (Munich)	1859	125	4,172	34 "
Naegelé (Heidelberg)	1819–1824	41	1,295	31 "
Rossi (Gratz.)	1858–1861	150	4,741	31 "
D'Outrepont (Wurtzburg)	1817–1841	106	2,223	30 "
Hohl (Halle)	1840–1857	56	1,700	30 "
Hugenberger (St. P.)	1845–1859	277	8,036	29 "
Betschler (Breslau)	1829–1831	21	610	29 "
C. Braun (Trieste)	1854–1855	20	568	28 "
Joerg (Leipsig)	1843–1846	21	563	27 "
Behm (Stettin)	1834–1859	25	672	27 "
Elsaser (Stuttgart)	1828–1841	81	1,950	24 "
Hassmann (Stuttgart)	1863–1865	41	1,000	24 "
Walter (Dorpat)	1806–1852	59	1,460	24 "
Martin, Ed. (Berlin)	1860–1867	196	4,677	27 "
Nagel (Berlin)	1856–1862	72	1,669	23 "
Siebold (Berlin)	1823–1828	43	983	23 "
Kilian (Bonn)	1828–1834	23	502	22 "
Ulsamer (Landshut)	1829–1842	67	1,464	22 "
D'Outrepont, Hoffmann	1842–1845	29	637	22 "
Hermann (Berne)	1858–1859	32	693	21 "
Stark and Sucrow (Jena)	1830–1838	16	338	21 "
Jungmann (Prague)	1842–1844	267	5,447	20 "
Stark, I. and II. (Jena)	1794–1830	43	855	19 "
Birnbaum (Trieste)	1810–1854	121	2,580	19 "
Hüter (Marburg)	1833–1843	58	1,129	19 "

Name of Operator.	Period.	Number of Applications.	Total Number of Labors.	Proportion: One Application to
Hecker (Munich)	1859–1863	97	1,911	19 "
Helly (Trieste)	1860–1862	23	443	19 "
Credé (Berlin)	1852–1856	63	1,220	19 "
Grenzer (Dresden)	1845–1865	499	9,140	19 "
Schmidt (Berlin)	1844–1850	156	2,631	17 "
Abegg (Danzig)	1840–1863	306	5,190	17 "
Scanzoni (Wurtzburg)	1851–1863	252	4,170	17 "
Mende (Göttingen)	1823–1832	73	1,247	17 "
Merrem (Cologne)	1825–1826	19	301	16 "
D'Outrepont and Hoffmann	1805–1845	379	6,139	16 "
Busch (Marburg)	1819–1825	49	781	16 "
Kauffmann (Hanover)	1834	18	273	15 "
Carus (Dresden)	1813–1827	184	2,555	14 "
Busch (Berlin)	1829–1847	853	1,358	14 "
Breslau (Zurich)	1779–1794	37	517	14 "
Siebold (Gottingen)	1860–1863	245	3,252	13 "
Pernice (Grieswald)	1858–1861	23	316	13 "
Loder (Jena)	1833–1860	24	424	13 "
Haase (Dresden)	1827–1845	388	4,445	13 "
Brunatti (Dantzig)	1825–1827	25	287	11 "
Credè (Leipsig)	1856–1859	56	594	10 "
Schultze (Jena)	1859–1861	29	308	10 "
Strempfel, Krause, Veit and Winckel (Rostock)	1836–1864	97	916	9 "
Ritgen (Giessen)	1814–1818	30	282	9 "
Martin (Jena)	1838–1857	185	1,662	9 "
J. Stein (Marburg)	1805–1807	46	296	6 "
Streng (Prague)	1852–1855	62	257	4 "
Hohl (Halle)	1840–1857	259	899	3 "
		10,975	333,054	30

That is to say, 1 in about 30.

Application of Forceps in England.

Name.	Period.	Number of Applications.	Total Number of Labors.	Proportion: One Application to
John Clarke (Dublin)	1803–1847	1	3,878	3,878 labors.
Davis and Hall (Dublin)	1842–1857	6	7,302	1,217 "
Denman (London)	1842–1857	6	7,302	728 "
Clarke (Dublin)	1787–1793	14	10,000	724 "
F. H. Ramsbotham (London)	1828–1850	73	48,996	671 "
Granville (London)	1828–1850	73	16,258	621 "
Collins (Dublin)	1826–1833	26	16,654	574 "
Churchill (Dublin)	1826–1833	26	16,654	546 "
John Ramsbotham (London)	1820–1827	39	19,439	489 "
J. Y. Simpson (Edinboro')	1844–1846	3	1,417	472 "
Lever and Oldham (London)	1847–1854	29	11,224	400 "
Barnes (London)	1857–1858	6	2,418	400 "
J. S. Beale (London)	1857–1858	2	700	350 "
Hardy and McClintoch (Dublin)	1842–1845	24	6,634	276 "
Laurence (Edinboro')	1842–1845	28	1,000	250 "
Wellesley (Dublin)	1828–1829	4	711	177 "

Name.	Period.	Number of Applications.	Total Number of Labors.	Proportion: One Application to
Bland (London)…. ……………	1828–1829	4	711	158 "
J. H. Beale (London)……………	1842–1862	22	3,381	154 "
Beatty (Dublin)…………………	1842–1862	22	3,381	154 "
Granville-Bozzi (London)……. …	1818	5	640	128 "
Harrison (London)………………	1818	11	1,000	90 "
Sinclair Johnston (Dublin)………	1847–1854	200	13,748	69 "
Watson (Dublin)…………………	1847–1854	3	200	68 "
Lawrence, Montrose (Edinboro')…	1847–1854	28	1,000	35 "
Denham (Dublin)…………. ….	1862–1863	26	856	33 "
Rigby (London)…………………	1833	6	179	30 "
Moore (London)…. …………	1852–1862	40	485	12 "
Hamilton (Falkirk)……………	1852–1862	40	485	7–8 "

Jacquemier has collected the following figures from various sources:

Mme. Boivin……………………	in 20,517 labors.	96 forceps = 1 in 214
Mme. Lachapelle………………	" 22,243 "	76 " = 1 " 293
Clark (Dublin)…………………	" 10,199 "	14 " = 1 " 728
Collins (Dublin)………………	" 16,654 "	27 " = 1 " 617
Merriman Bland } London……………	" 3,697 "	21 " = 1 " 172
Ramsbotham…. ……………	" 26,676 "	34 " = 1 " 785
Boer (Vienna). ………………	" 9,589 "	35 " = 1 " 274
Naegelé (Heidelberg)……………	" 1,411 "	22 " = 1 " 64
Carus (Dresden)………………	" 2,549 "	184 " = 1 " 14
Kluge (Berlin)…………………	" 1,111 "	68 " = 1 " 16
Siebold (Berlin)………………	" 2,093 "	300 " = 1 " 7

PROGNOSIS.

In stating this we meet with the same difficulty as in the preceding. The figures vary with the accoucheurs. Aside from the question of operative ability, which is of great weight, can we compare the different conditions which call for the forceps? Can we compare forceps used in case of inertia uteri, or of resistance of the soft parts, or of delay of the head at the inferior strait or in the cavity, with the instrument used in case of pelvic deformity, or of arrest of the head at the superior strait, or of eclampsia, etc.?

What we can say is that the forceps in the hands of an expert is not only inoffensive *per se*, but is a true savior both of the mother and of the child, whilst in clumsy hands, or when used contrary to classical rules, it may mean grave injury to the mother and the child.

Pajot and Budin have mentioned nearly all such injuries in their theses

For the mother, injuries of the vulva, perineum, vagina, of the cervix, of the uterus, of the rectum, the urinary organs, the pelvic cellular tissue, the vessels, nerves, bones of the pelvis, etc. For the child, every lesion from simple excoriation to fracture. There is one which is very frequent, and happily transitory, and this is facial paralysis. Nadaud, in 1872, mentioned two cases of paralysis of the common motor of the eye, (observed by Dr. Lisbonne, at Dublin), and cases of paralysis of the limbs observed by Smellie, Guéniot, Blot, Depaul, Duchenne of Bologne, Doherty, and ourselves.

The danger to the infant increases, of course, with the force used, the irregular grasp and elevation of the head. Internally, the vessels of the brain may be torn, or the venous sinuses, and there are effects resulting from compression of the brain.

Poppel, in 102 cases of forceps without complication, found 61 living children, 36 asphyxiated, of whom 30 were saved, and 5 dead, mortality of 10.8 per cent.

Hugenberger in 100 cases of forceps in pelvic deformity, had 70 sick women, 30 of whom died.

·Rigaud and Stanesco have shown that the mortality increases with the degree of contraction.

Sickel, in 475,616 births, found 6,963 applications of the forceps.

In 1,281 cases	Head first	1,228
	After-coming	53

Of 6,228 infants born by forceps, 5,159 living, 1,069 dead. Of 6,685 labors by forceps 5,501 mothers living, 184 dead.

As Zweifel says, "forceps applications are one-half less dangerous than version."

The following tables taken from Murphy and Harper, give the figures of certain English accoucheurs:

Table from Murphy.

Accoucheurs.	Number of Deliveries.	Labors Normal Duration over 24 hours.					Forceps.					Lever.				
			Mothers.		Infants.			Mothers.		Infants.			Mothers.		Infants.	
			Living	Dead.	Living	Dead.		Living	Dead.	Living	Dead.		Living	Dead.	Living	Dead.
Collins	16,654	324	299	25	263	61	24	20	4	16	8	3	3		8	
Hardy & McClintock	6,634	171	162	9	119	52	24	19	5	11	13	17	17		8	9
Johnston & Sinclair	13,748	247	235	12	198	49	200	189	11	171	29					
	37,036	742	696	46	580	162	248	228	20	198	50	20	20		11	9

Table from Harper.

	Frequency of Application.	Fœtal Mortality.	Maternal Mortality.	Duration of Labor.
Collins	1:694	1:26	1: 329	38 hours.
Hardy	1:555	1:20	1: 334	35 "
Johnston	1:600	1:30	1: 502	29 "
Harper	1:260	1:47	1:1490	16 "

CHAPTER III.

THE FILET.—THE SERICEPS.

MAURICEAU was the first to entertain the idea of extracting the fœtal head by means of inoffensive instruments. Amand, in 1714, devised a hood destined to remove from the uterus the decapitated head. About one hundred years ago, Mead, in England, thought of using a cloth loop to be placed between the chin and the thorax, and Playfair mentions, only to condemn, the filet of Earldly Wilson. Precisely the same instrument was used in Japan, in 1812, by one of the Kangawas.

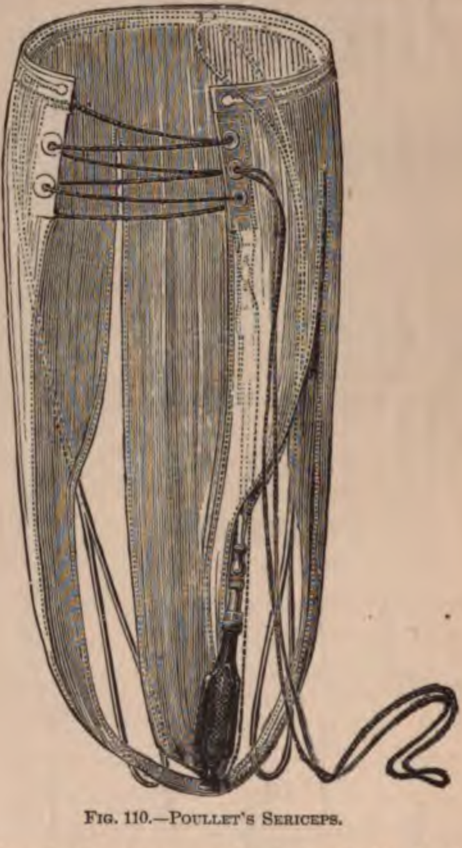


FIG. 110.—POULLET'S SERICEPS.

In 1875, Poullet invented an instrument which he calls the *sericeps*, and a new mechanical tractor to be adapted to the sericeps to increase the force of the tractions. The following is the description of the sericeps:

"It is composed of: 1. A piece of cloth 9¾ inches long. 2. Four ribbons inserted along the inferior border of this cloth, and united together in pairs to make two loops. (Fig. 110.) The transverse band is placed around the fœtal head, and the borders are laced together. When the ovoid of the head has been well grasped, and we pull on the loops, the head is obliged to descend. The transverse band and the ribbons are doubly lined, making fingers in which are slipped the metallic rods which place the apparatus over the head. When the head has been grasped the metallic rods are withdrawn, and the apparatus is ready for traction. (Fig. 111.)

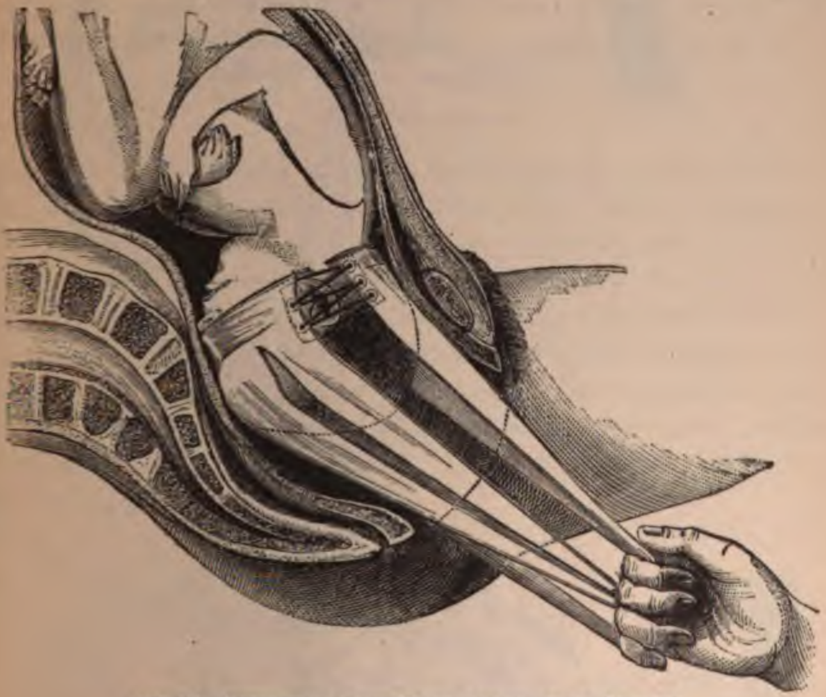


FIG. 111.—EXTRACTION OF THE HEAD BY MEANS OF THE SERICEPS.

"In case greater traction is needed than can be applied through the loops, the tractor is to be adjusted." (Fig. 112).

By means of the sericeps Poullet has succeeded in ten cases, but we

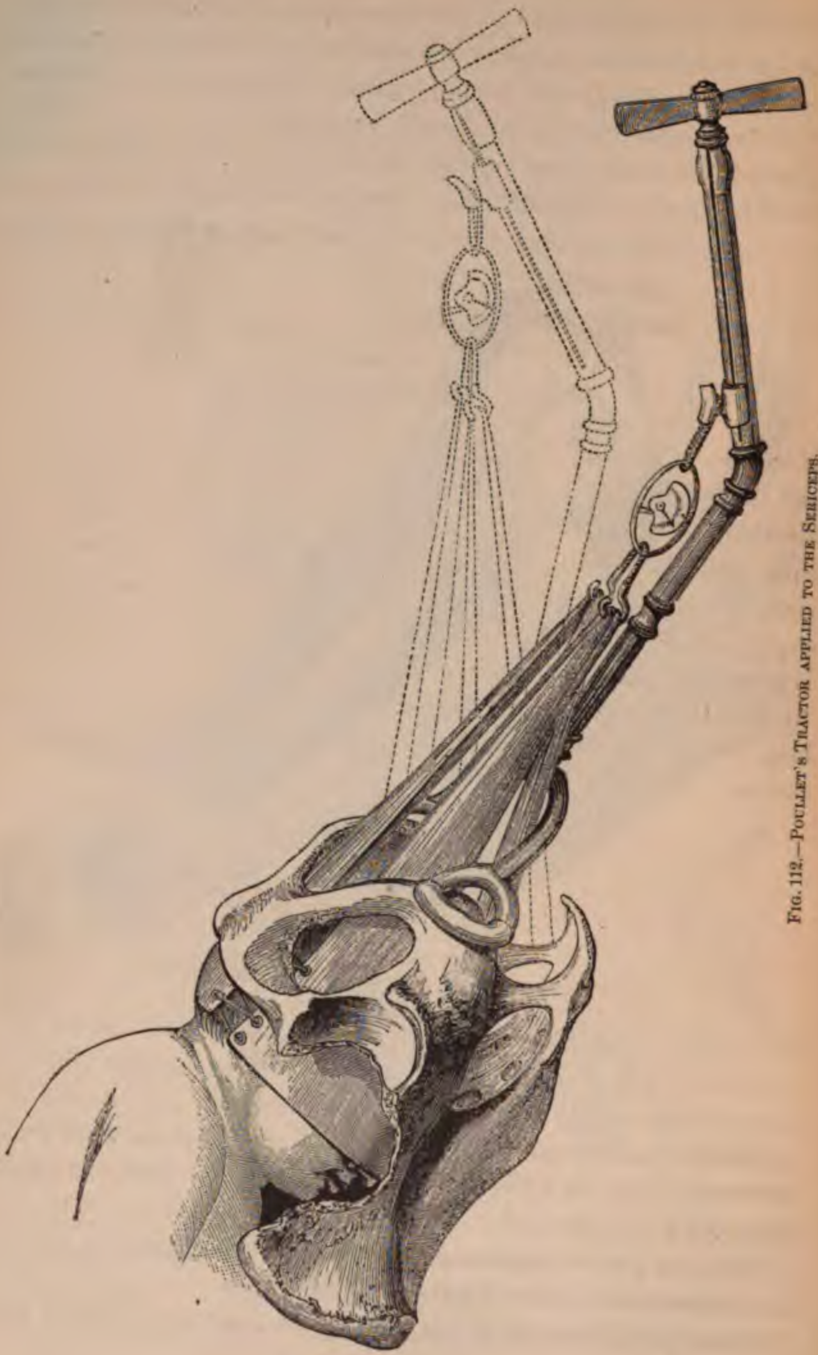


Fig. 112.—Poullet's Tractor applied to the Sericeps.

doubt its utility in the obstetric armamentarium, and we believe it is destined to be relegated to the obscurity of the retroceps of Hamon, the leniceps of Mattei, the filets of Mead, Kangawa, Wilmot and others, and the air extractor, that monstrosity devised by Simpson.

Poullet has lately devised another sericeps, and he has given us the description and the illustrations. The new instrument is a modification of the old, which was very difficult to insert, especially between the head and the promontory, and the head and the pubes. The new instrument aims at facilitating this. It is composed of two flexible steel blades, unequal in length, the one to be applied to the left, and the other to the right of the pelvis. The longer blade consists of two narrow flexible steel blades, 5¾ inches in length, united superiorly by a steel plate, which is movable. They are curved on the flat, about like the cephalic curve. At their inferior extremity, the one is attached to a steel tube 7 inches long, the other to an inner steel rod. A screw on this rod fixes the two blades. (Fig. 113.)

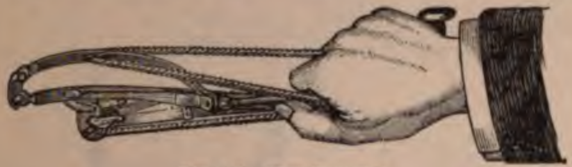


FIG. 113.—NEW SERICEPS.

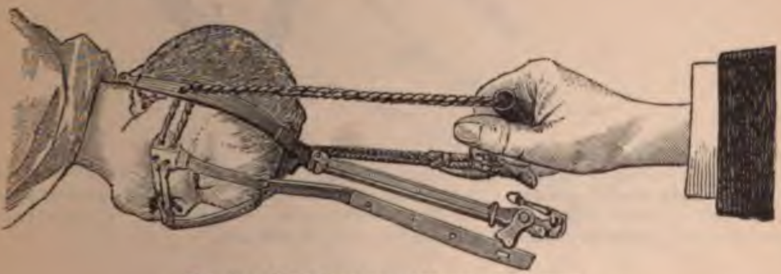


FIG. 114.—NEW SERICEPS, APPLIED AND ACTING.

The short blade is like the other, only it is but 3¾ inches long, and the extremity of the two blades which compose it are united by a silk loop 2¾ inches long. Applied over the face, this loop will not act on the neck.

The completed instrument in position is shown in Fig. 114.

The instrument requires more time for application than the forceps, but this is not difficult at the superior strait. Its advantages are:

1. It exercises no compression transversely in the pelvis; on the contrary, it slightly reduces the head in the longest diameter.

2. It pulls on the entire occiput, and does not engage the head till it is flexed; and further it does not in the least interfere with rotation.

3. The entire transverse portion of the pelvis is left free to the head, and it may, therefore, as in version, slide along the *linea innominata*, and may engage in the contracted part of the pelvis in a diameter approaching the bi-temporal.

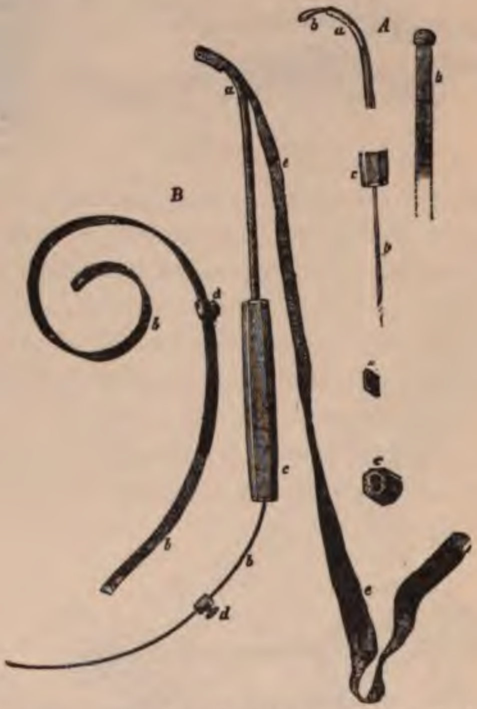


FIG. 115.—*Aa*, Superior extremity and opening of the conducting rod. *b*, Metallic conducting wire, seen in front and in profile. *C*, Inferior extremity of the handle of the conducting rod, and inferior orifice. *Ba*, Conducting rod. *c*, Handle of the wire. *b*, Steel blade. *d*, Screw slide for limiting the amount of wire to be carried over the groin. *e*, Silk filet.

The Japanese were not content with devising filets for the extraction of the fœtal head, but also endeavored to facilitate delivery, in case of shoulder presentation, by passing a filet over the pelvic extremity. Latterly, Wecbecker-Sternfeld has re-advocated this measure in case of breech presentations. Rejecting blunt hooks as dangerous, he follows the example set by Hecker and Grégory, and uses the filet introduced by means of the instruments represented in Figs. 115, 116, 117.

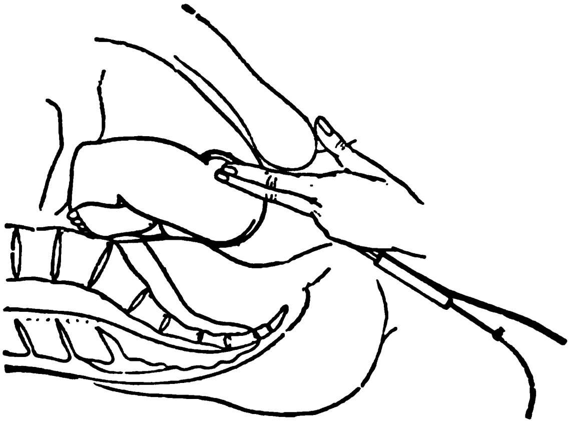


FIG. 116.--APPLICATION OF THE FILET-CARRIER.

Of his 30 observations, the following are the results.

		Children living.	Children dead.
30 labors	Primiparæ 21 . . .	17	4
	Multiparæ 9 . . .	7	2

Of the 21 children born of primiparæ, 8 were asphyxiated, and 7 of these lived. Of the 9 born of multiparæ, 2 were asphyxiated but survived, and one other lived for ¾ hours, and at autopsy showed evidence of visceral syphilis.

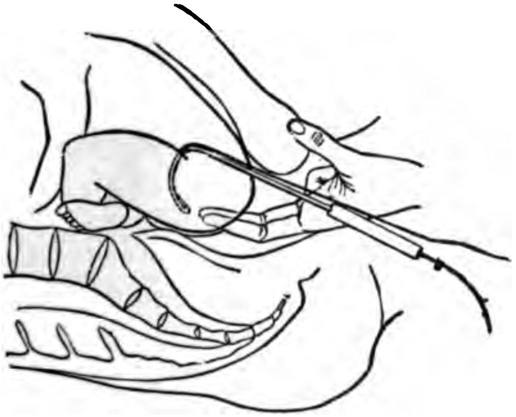


FIG. 117.—THE FINGERS SEEKING THE METALLIC WIRE.--(The mechanism of the instrument is like Belloc's Sound.)

The 6 deaths were due to the following causes:

Primiparæ
1. Asphyxia. Extravasation in the brain.
2. Syphilis.
3. Difficult labor.
4. " "

Multiparæ
1. Interference with intra-uterine circulation.
2. Compression of the cord.

The lesions produced by the filet were:

Traces of deep compression of soft parts, .	4 times.
Superficial excoriations, ...	2 "
Non-essential traces of compression, . .	24 "

In one case the humerus was fractured in disengaging the arms; twice the femur, once in the endeavor to bring down a foot, once during extraction with the filet.

As for the mothers, the introduction of the filet did no damage. The perineum was lacerated eight times in the primiparæ, through rapid extraction of the head. The puerperium was invariably normal.

CHAPTER IV.

THE LEVER.

INVENTED by the Chamberlens, probably at the same time as the forceps, sold secretly to Roonhuysen (Fig. 118), then to Jean de Bruyn, bought finally by Jacques de Vischer and Van de Poll, who made it known to the profession, the primitive lever was composed, according to Jacquemier's description borrowed from Smellie, of an iron blade 11 inches long, 1½ wide, and 1½ lines thick, presenting at its extremities two slight curves. Variously modified, and used successively by Titsing, Rechberger, Camper, Zeller, Bland, Boeckmann, Rigodeaux (Douai), Warocquier (Lille), it found in the forceps a formidable rival. Levret and Smellie were its first and most enthusiastic advocates. Baudelocque and his pupils rejected it, although the former had modified it advantageously by fenestrating the blade. (Fig. 119.) It was again advocated by Herbiniaux, Denman, Sims, Douglas, Nesbit, Cole, Griffith, Ford, Cooper and others, and rejected almost absolutely in Germany. It was modified further by Verardini (Bologne), (Fig. 120), Bodaert (Figs. 121 to 123,) and used by Coppel, Fraeys (Gand), Marchant of Charenton, Fabri (Bologne), Hubert, jr., who added to it three inches of blade, and two holes through which a cord was passed, (Fig. 124); and finally, of late years, it has been studied by Jacquemier and Tarnier. Nevertheless, the forceps is to-day universally admitted superior, and, as Jacquemier says: "The real question to-day is, whether in contraction at the pelvic inlet, allowing of the passage of the head, but where the forceps is lacking in ease of application and direction of traction, the lever is not a better instrument, a more powerful tractor, and less dangerous to mother and to child. Results from its use would seem to prove this. It ought only to act, as indeed it was alone devised, on the fœtal occiput."

According to Wasseige, the lever may act in three different ways:

1. Like a lever of the first class, the power of which is at the handle, the fulcrum towards the middle of the blade, under the symphysis, and

the resistance at the fœtal head. The power is to the resistance as P.R. to P.F.; and hence if Bodaert's lever is inserted three inches (Fig. 121), the force is tripled, the fulcrum is submitted to a pressure represented by the sum of the forces (power and resistance) applied to the two arms of the lever, supposing them parallel.

2. The instrument should be inserted so that the power is placed between the resistance and the fulcrum—that is to say, the handle is to be fixed at P, while the other hand pulls at F, in the direction of the arrow. (Fig. 122.) Then there is no pressure at the pubes; but in order to overcome the resistance, a force superior to it must be used.

3. Finally traction may be made on the lever in the direction of the two arrows (Fig. 123); we thus diminish pressure upon the pubes, and the resistance is more easily overcome.

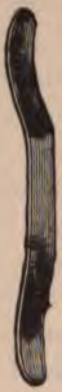


FIG. 118.—ROONHUYSEN'S LEVER

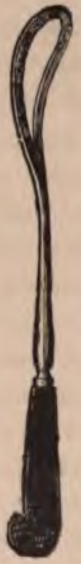


FIG. 119.—BAUDELOCQUE'S LEVER.

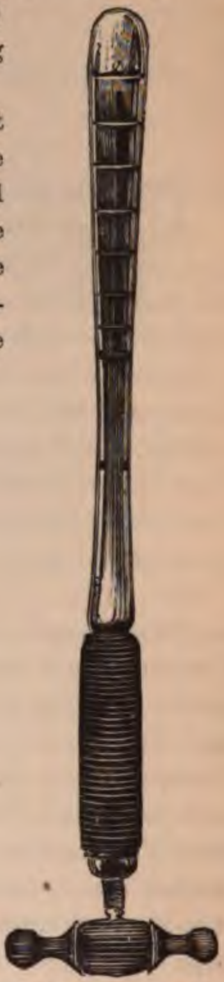
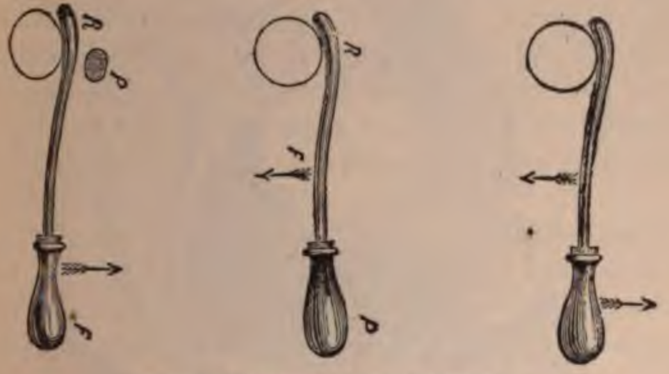


FIG. 120.—VERARDINI'S LEVER.

Herbiniaux aimed at this mixed method when he passed a filet through the fenestra of his instrument, by pulling on the cords and lifting by little jerks.

Hubert, the son, advises holding the handles of the instrument, and making traction only on the filet ends passed through the holes in the blade. (Fig. 124.)

The direction given to the head varies necessarily with the inclination of the instrument to the fulcrum, and on the point of application to the head. Thus: 1. If the blade be inserted parallel to the symphysis, the head is pushed backward by pressure on the handle; and as this is lifted the head is finally pushed downward. 2. By lifting the handle, that portion of the head on which the blade rests, may be rotated to right or to left, or flexed or extended. In other words, as Hubert, the younger, says, we can treat it as we do a billiard ball, by touching it where we please.



FIGS. 121, 122 and 123.—LEVER OF BODAERT.

The method of using the lever is very much like that of the forceps. The blade may be placed at once where it should lie. Tarnier prefers to insert it behind near the sacro-sciatic ligament, and then to bring it forward spirally. Once well applied, it ought to lie next to the posterior surface of the pubes, its action on the head being from in front backwards. "When, says Tarnier, the lever is well applied, the handle is raised, and the instrument taking purchase at the symphysis acts like a first-class lever. The head is lowered by the power at the handle, and continuing this motion with a few tractions, the head is delivered. To avoid contusion of the urethra, the lever should be wrapped with linen, or with rubber, and placed to one side of the median line. It easily slips when applied as above, and pressure on the ischio-pubic ramus contuses it; to prevent this, the handle is firmly grasped in the middle by the left hand, to prevent slipping, at the same time making pressure backwards to re-enforce the fulcrum and diminish the pressure on the symphysis."

Struck by the facts cited by Bodaert, and by those of Fabri, and of his own experiments, made with the lever, Tarnier concludes that it cannot be compared with the forceps as a tractor, since it acts by compressing the head from before backwards. But although it cannot take the place of the forceps, it may, and it should be used in certain cases. He thinks that the action of the lever should be studied in: 1. Vertex presentations. 2. Face presentations. 3. Presentation of the breech, after the body has been delivered, and the head remains.

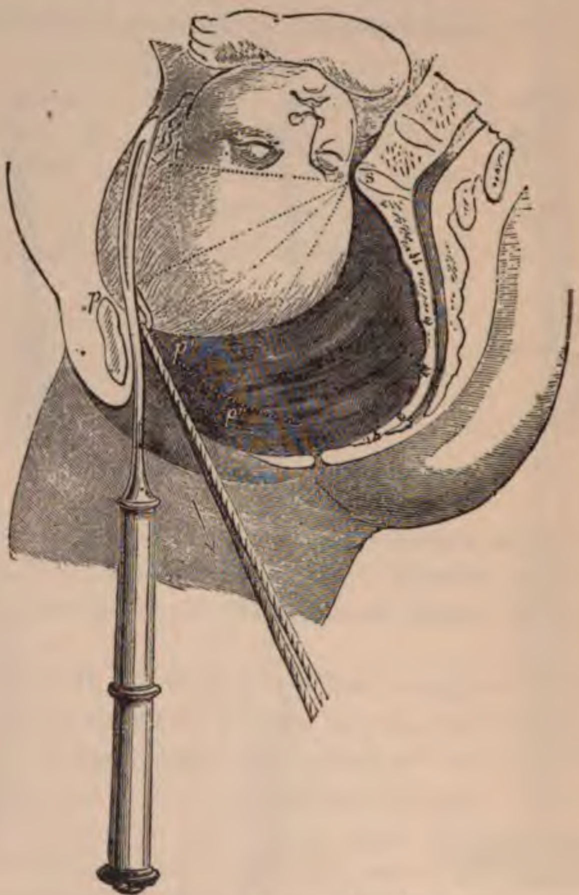


FIG. 124.—LEVER OF HUBERT, THE YOUNGER.

Presentation of the Vertex.

1. *Head at the Inferior Strait.*—The forceps is superior to the lever, which pushes the head towards the coccyx, places it away from the centre of the vulva, and exposes the perineum to laceration. Only does the lever excel the forceps when the inferior strait is narrowed transversely by the contiguity of the ischio-pubic rami, or the ischiatic tuberosities. Thanks to its little size, it is then easily applied, and can push the head backward where there is more room.

2. *Head in the Cavity.*—The forceps still excels the lever, for with it we may rotate the head, while in posterior presentations the lever would necessarily meet the face, and injure it greatly. Bodaert, nevertheless, has used it with success, but on the extended head, and when the anterior fontanelle was near the centre of the pelvis.

3. *Head at the Superior Strait.*—Tarnier is disposed to use the lever. The difficulty of grasping the head regularly, the impossibility of making traction in the desire ddirection, make him favor the lever, which is smaller than the forceps, and working only on the occiput, tends to flex the head, at the same time that it depresses it. Applied behind the pubes, it compresses the head from before backward, while it elongates it transversely, or in the diameter which is not shortened. Tarnier, however, is not forgetful of the difficulty due to mobility of the head, and the danger of inflicting rupture or vesico-vaginal fistulæ.

Presentation of the Face.

In the cavity or at the inferior strait, the choice should be the forceps. At the superior strait, the lever might better direct the head into the axis of the inlet, and will reduce its size from before backwards. But here the lever requires more care than in case of the vertex, since it must be applied to the face, or to the occiput, and the injuries possible with the instrument are the greater the higher it is placed. We believe, therefore, that the forceps should be preferred.

Head retained after Extraction of the Body.

Coppeé has, in particular, recommended the lever in these cases. We have seen that, thanks to compression combined with traction and flexion, the forceps are not often needed, and the lever, therefore, would only exceptionally be required.

The lever then must remain an exceptional instrument. When used there is one absolute rule, and this is, if the occiput is in front or transverse, apply the lever to it, or to the mastoid; if the forehead is in front, apply the instrument over the temple, so as to seize the brow or the sinciput, according as it is deeply placed or not.

Not so bold as Tarnier, Jacquemier absolutely rejects the lever in occipito-posterior positions, in the cavity, at the inferior strait, in face presentations. He admits its utility at the superior strait with reserve. Recalling the experiments of Fabri and of Tarnier, he says, "We should judge too favorably of the solid grasp of the lever on the head, if we were to accept literally those experiments made in full view, where the ***point d'appui*** and the immobility of the head are assured beforehand, advantages which we do not ordinarily possess. In case of pelvic deformity, however, where the forceps has failed, cranioclasty is not justifiable, neither is the Cæsarean section if the child be alive, till we have tried the lever."

These conclusions seem to us too favorable. To attempt, after repeated use of the forceps, to extract with the lever is to subject the woman to renewed injury, and likely enough not succeed in delivering the head. When the forceps is applied at the superior strait, it is only after a long labor, and when the waters have for long escaped. We interfere then either in the interest of the mother, and must deliver quickly and with the least possible violence, or else in those of the child whose life is in danger. To attempt with the lever, therefore, what the forceps has failed in accomplishing, seems to us worse than useless. Far better, we think, to sacrifice the child, and give the mother a chance by lessening the risk of injury through reduction in volume of the fœtus.

CHAPTER V.

THE INDUCTION OF PREMATURE LABOR.

AT first limited to cases of hemorrhage, later extended to pelvic contraction, and later still to all obstacles which might render labor at term difficult, dangerous, or impossible, for both mother and child, the induction of premature labor may be defined as an operation performed in the interests of the mother or of the child, and aiming at awakening uterine contractions, so as to cause the expulsion of the infant before the natural term of pregnancy, although at a time when this infant is able to live outside of the uterus, that is to say, is viable. Premature labor, then, is included between the seventh month of pregnancy and term.

Although Justin Siegmundin in 1690, Puzos in 1707, and Bohn in 1717, advised rupture of the membranes in case of hemorrhage due to placenta prævia, and so induced premature labor, it was not for some years afterwards that this procedure, in case of deformity of the pelvis too great for the passage of the fœtal head at term, was admitted into obstetric practice, and it was in 1756, Denman tells us, that the most distinguished physicians of London gave the method their unanimous sanction, in view of the fact that many women with pelvic contraction had been delivered prematurely and spontaneously of viable children who had lived. It is to England, therefore, that the origin of this operation belongs.

Practised for the first time, some say by a midwife, Mary Dunally, others by Macaulay, or Kelly, the induction of premature labor became the rule in practice, through the efforts of Barlow, Denman, Merriman, Marshall, Clark, Ramsbotham, Burns, and others. From England, the operation passed to Germany, where Mai first advised it in 1799, and he was followed by Weidmann; but it was not till 1804 that Wenzel first performed it. Krauss practised it in 1813, but only on the appearance of the monograph of Reisinger, in 1818, was the operation finally adopted. The greatest partisans of the operation were Osiander, Joerg, Stein the younger, Kluge, Ritgen. In Holland, J. Themmen, Salomon, Vrolik, Wellenbergh performed it. In Italy, Lorati, Billi, Ferrario, reported successes. In France, although proposed, in 1804, by Roussel de Vauzesmes, it was still rejected by the Academy of Medicine in 1827, owing to the influence of Baudelocque; it was not till 1831 that Stoltz resorted to it, and so successfully, that he was followed in 1832, 1834, by P. Dubois, and from this time on, thanks to the efforts of Dezeimeris, Lacour, Ferniot, and Lazare Seé, it was performed and written about constantly, until to-day it is the practice of all French accoucheurs.

While the operation was becoming generalized, its indications were widening, and to-day they are almost infinite. The indications, however, are subordinated to a certain number of conditions, which Naegelé and Grenser state as follows:

1. Exact diagnosis of the shape of the pelvis
2. Certainty of fœtal life.
3. Determination as far as possible of the date of gestation.
4. Absence of serious disease which might be aggravated by the operation.

INDICATIONS.

The most frequent indication for the induction of premature labor, the one for which it was originally performed, is contraction of the pelvis. Authorities, however, are not in accord in regard to the limits of this contraction, that is to say, as to where the line is to be drawn which justifies resort to the procedure.

Spiegelberg, in 1870, from the study of the results of the operation in case of deformity of the pelvis, constructed the table on the following page, which sets forth the practice of different authorities.

Comparing now these results with those obtained in case of the spontaneous induction of premature labor in case of pelvic deformity, and with labor, under the same condition, terminated by forceps and version, he places the upper limit of justifiability of the operation at 3.12 inches. Whenever the maximum contraction does not reach this figure in the true conjugate, he rejects premature labor, except where from previous labors large children are to be expected with large heads, etc.

In 1871 Litzmann concluded that Spiegelberg had understated the indication. He ranges himself, and we think justly, on the side of the mother's interest mainly. He divides pelves into three classes:

1. Pelvis generally and regularly contracted, diameter 3.9 to 3.5 inches; Pelvis simply flattened, or generally contracted from 3.7 to 3.19 inches. Here premature labor is only justifiable in case of complication.

Induction of Premature Labor in Case of Contracted Pelvis.

Operators.	Number of Cases.	Mothers.		Children.		Dead after Labor.	Total Number of Deaths.
		Living.	Dead.	Living.	Dead-born.		
Michaelis	6	4	2	1	3	2	5
Busch	8	7	1	2	8	4	7
Spaeth	15	10	5	1	5	9	14
Crede	8	6	2	4	1	3	4
Germann	19	17	2	9	2	8	10
Riedel	6	6	0	1	4	1	5
Cohen	8	8	0	1	2	0	2
Birnbaum	6	5	1	3	1	2	3
Franque	12	11	1	1	7	4	11
Grenser	25	19	6	4	13	9	22
Hecker	3	3	0	1	0	2	2
Schroeder	6	5	1	2	0	4	4
Scanzoni	14	14	0	3	7	4	11
Martin	39	34	5	24	12	3	15
Dohrn	9	9	0	4	3	2	5
Isolated Cases	12	10	2	5	4	3	7
Lange	14	13	1	4	6	4	10
Spiegelberg	14	10	4	3	4	7	11
Total	219	186 per cent. 84.9	33 per cent. 15	73 per cent. 33	77 per cent. 34.8	71 per cent. 32.1	148 per cent. 66.9

2. Pelvis generally and regularly contracted, 3.5 inches at least. Pelvis simply flattened, or generally contracted and flattened, 3.19 to 2.8 inches. Operation is indicated, even in primiparæ.

3. Pelvis simply contracted, or generally contracted and flattened, about .29 of an inch. The operation is only exceptionally admitted.

Presentation and Position of Fœtus.	Spontaneous Labor in contracted Pelvis.				Induced Labor in contracted Pelvis.			
	No. of Cases.	Proportion to Entire No. of Labors	Children dead immediately after or during Labor.		No. of Cases.	Proportion to Entire No. of Labors	Children dead immediately after or during Labor.	
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Vertex	287	84.6	33 or 11.4	14.1	14	41.1	7 or 50	42.1
Prolapse of cord	20	5.8	11 " 55		3	8.8	1 " 33.8	
" of limb	3	.8	0 0		2	5.8	0	
Face	2	.5	2 or 100	40.7	0	0	0	73.3
Pelvic Extremity	22	6.4	7 " 31.8		9[1]	26.4	7 or 77.7	
Oblique and Transverse Presentations	5	1.4	4 " 80		6	17.6	4 or 66.6	

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[1] Including one child whose mother died undelivered.

Next comparing spontaneous premature labor, and induced from the side of the child, Litzmann gives the following table:

	Total.	Dead during or immediately after Labor.	Boys.	Dead during or immediately after Labor.	Girls.	Dead during or immediately after Labor.
		Per cent.		Per cent.		Per cent.
Premature spontaneous Labor, with large Pelvis.......... ..	118[1]	9 or 7.6	50	6 or 12	68	8 or 4.4
With small Pelvis....	16	5 or 81.2	10	4 or 40	[illegible]	1 or 6.2
2. Induced premature Labor in contracted Pelvis...............	34	19 or 55.8	21	11 or 54.7	13	7 or 53.8
	168	33 or 19.6	81	21 or 25.9.	87	11 or 12.6

[1] Including nine street deliveries.

In 1880, Maygrier in turn endeavored to estimate the value of premature labor (induced).

In 37 cases, in pelves 2.73 inches and below: Mothers saved 23, dead 11, mortality about 33.33 per cent. Infants saved 12, dead 22, mortality about 64.70 per cent.

Further, of these 12 living children eight died within the first week. From the standpoint of the infant, these figures may be arranged:

4 labors at	8 months,	pelvis 2.73 inches.	Infants living,	3
6 "	" 7½ "	" 2.53 "	. "	1
2 "	" 7 "	. . .	"	0
1 "	unknown	. . . . .	"	0

Kunne, at Elberfeld, has induced labor fifteen times. All the mothers recovered, two only being sick; of the 15 infants, 12 were born alive and lived.

Berthold, at Ronsdorf, practised the following operations, from 1870 to 1873:

Induction of premature labor .	9	Maternal death,	0
Forceps to head, ...	30	"	1
Podalic version and extraction, .	17	"	1
Pelvic extremity, . . .	3	"	0
Perforation, ...	3	"	0
Reposition of the cord, . .	1	"	0
Artificial delivery, . . .	6	"	1
Total	69		3

Nothing is said about the infants.

Naegelé and Grenser place the limits between 2.73 and 3.7 inches. Schroeder gives no upper limit, the inferior limit is 2.63 inches. Jacquemier places it as low as 2.54 inches; Dubois 2.54 inches; Joulin 2.54 inches; Velpeau 2.63 inches; Cazeaux 2.34 inches; Depaul 2.34 inches; Tarnier 2.14 inches. According to the latter, if extraction of a living child is impossible, embryotomy offers a better chance, for the very reason that the fœtus is only partially developed.

Considering now the figures of Rigaud and of Stanesco, we have a total of 810 cases of pelvic contraction, where premature labor was induced. They may be divided as follows:

Pelvis.	Cases.	Maternal deaths.	Mothers living.	Infants.	
				Living.	Died.
3.51 inches . .	3	1	2	3	0
3.51 to 3.12 “ . .	17	3	14	6	8
3.12 “ 2.73 “ . .	18	5	13	6	12
2.73 “ 2.34 “ . .	10	4	6	1	9
2.34 “ 1.95 “ . .	5	3	2	0	5
	53	16	37	16	34

We see, then, that underneath 2.34 inches premature labor has always been fatal to the infant. It is apparent that under this figure we must reject the operation, although a personal case, which we have already related, where the pelvis was 2.14 inches, and the child, at seven months, was born alive and lived twenty-four hours, would lead us to place the limit at 2.14 inches. Such cases, however, are very exceptional, and we may say that below 2.34 to 2.14 inches there remains only the Cæsarean section, or cephalotripsy with or without traction. Now, considering the danger to the mother of both these methods, and considering the almost absolute fatality of induced premature labor to the infant in case of such pronounced contraction, it is really to induced miscarriage, that is to say, before viability, that we should have recourse.

From the researches of Burns, Salomon, Dubois, Stoltz, Tarnier, Budin, etc., it is seen that the bi-parietal diameter of the fœtal head measures:

At term, ...	3.7 inches.
At 9 months, ...	3.5 “
At 8½ “	3.3 “
At 8 “	3.1 inches.
At 7½ “	2.9 “
At 7 “	2.7 “

These figures, be it remembered, are not at all absolute, being only means. We have seen that the fœtal head was compressible to the extent of .39 inches without danger to the life of the child. It is evident, therefore, that below 2.34 inches the head might be delivered by the forceps, but at the expense of injury to it and to the mother. Whence the necessity, in order to obtain a living child, of limiting the induction of premature labor at 2.34 inches; and although we have stated above that the limit might be 2.14 inches, it is because the head is at times more readily moulded, or the infant less developed, and hence may pass. Of course this lesser development means less chance of survival; nevertheless, encouraged by our one success, we would take the chances in analogous cases.

Further indications for premature labor are complications which threaten the life of the mother, whether these complications are determined by pregnancy, or aggravated by the presence of this condition. Such are: Uncontrollable vomiting, eclampsia (according to certain authorities, although we are, as stated under the subject, absolutely opposed to this), hemorrhages, acute or chronic diseases of the respiratory and circulatory organs, hydramnios, ascites, goitre (d'Outrepont,) prolapsus uteri, pernicious anæmia of the gravida (Gusserow), abdominal tumors, intercurrent or epidemic diseases. (See The Pathology of Pregnancy, Vol. II.) Here the question is a delicate one. We must not forget that the induction of labor by determining in the woman what Raymond has called the great puerperal state may aggravate her condition, and thus we may act directly against our aim. The case is somewhat analogous to what happens to a wounded man with a compound fracture requiring amputation. If this operation be done at once, he dies; if we allow him to recover from shock and then operate, his chances of life are greater. The state of affairs is about the same in the pregnant woman suffering from an acute disease. If in her already depressed condition, we add the shock of premature labor, we diminish her chances of recovery. Only as a last hope should we, hence, induce labor in this case, and then in order to diminish the gravity of the disease from which she is suffering.

Finally, the induction of labor has been recommended in certain anomalies of pregnancy, such as the habitual death of the fœtus without known cause. In such a case, if the antecedents or the constitution of the woman do not call for special treatment, such as in syphilis, we are justified in inducing labor.

Certain authorities go further still, and have advocated the induction of labor where the fœtus has died and remains in the uterus. Here we believe the operation to be absolutely contra-indicated, since the presence of the fœtus cannot harm the mother as long as the ovum is intact.

Premature labor being indicated, it remains to study the means at our disposal for induction.

When the indication is a complication or disease threatening the life of the mother, the choice of the time is absolutely subordinated to the gravity of the complication and the state of the mother. In these cases, there being no obstacle to the birth of the fœtus, it runs no more risk than in normal labor; we seek simply to put off the time as long as is possible, as near to term as is possible, in order to increase the infant's chances of survival, remembering chiefly always, however, the interests of the mother, since it is for her life that we are going to interfere. Act, then, neither too soon nor too late, being guided purely by the nature of the complication, and its effect on the mother.

The question is more difficult of decision in case of pelvic deformity. Although we may usually reach a fairly exact idea of the form of the pelvis, it is far otherwise as to the period of pregnancy, and the volume of the fœtus, two conditions of capital importance.

1. *The State of Pregnancy.*—We have seen already (*vide* Pregnancy, Vol. I.), that it is almost impossible to determine the exact date, and that we are always liable to great error. Of 50 women studied by P. Dubois, in order to find out the possible variations between the supposed date of pregnancy and the real, in 17 cases the difference was 8 days; in 17 others between 8 and 15 days; in 3 between 15 and 20 days; in 13 between 20 to 30 days. The supposed date of pregnancy was placed 8 times before, and 41 times after the real. From these cases, and 100 others, Dubois states that 15 days' error is ordinarily possible.

The gravity of such an error is understood, when we are dealing with a contracted pelvis requiring premature labor between 7 and 7½ months. The data given by the patients in regard to the last menstruation are often very inexact, and the fœtus being entirely above the cavity, our error would be great if we based an opinion on the development of the abdomen.

2. *Volume of the Fœtus.*—Ahlfeld has endeavored to determine this in order, on the one hand, to find out the period of gestation, and, on the

other, to recognize the disproportion existing between the fœtus and the possible degrees of pelvic contraction. After having shown that the rational history and the main physical signs furnish only illusory data, he concludes that the only absolute is given by the volume of the fœtus. He has endeavored, hence, to measure this, and he has reached the following conclusions: The fœtus being in a state of flexion, it constitutes an ovoid, one pole formed by the lowest part of the head, and the other by the highest of the breech. By measuring the distance between these two poles, that is to say, the intra-uterine longitudinal axis of the fœtus, Ahlfeld has determined that it represents about one-half of the total fœtal length. We may thus obtain quite an exact idea of the true length by measuring the axis. We may measure this axis by means of the pelvimeter, one blade in the vagina to one pole of the ovoid, the other on the abdominal wall over the second pole. Doubling this measurement will give us the true length of the fœtus, and thence the age of the gestation. In the following tables Ahlfeld's experiments are resumed:

Mean Weight and Length of the Fœtus by Weeks.

40th week	Weight 6.97 lbs.	Length 19.6 inches.
39th “	“ 7.30 “	“ 19.73 “
38th “	“ 6.63 “	“ 19.46 “
37th “	“ 6.32 “	“ 18.83 “
36th “	“ 6.17 “	“ 18.83 “
35th “	“ 6.05 “	“ 17.44 “
34th “	“ 5.33 “	“ 17.96 “
33rd “	“ 4.58 “	“ 17.12 “
32nd “	“ 4.63 “	“ 16.09 “
31st “	“ 4.33 “	“ 17.04 “
30th “	“ 4.11 “	“ 16.38 “
29th “	“ 3.46 “	“ 15.4 “
28th “	“ 3.59 “	“ 15.71 “
27th “	“ 2.51 “	“ 14.15 “

Intra-Uterine Volume of Fœtus.—Mean.

Week of pregnancy.	Mean length.	Number of cases.	Length at same period of infant born.	Week of pregnancy.	Mean length.	Number of cases.	Length at same period of infant born.
40th.	9.98 in.	2	19.6 in.	31st.	8.46 in.	4	17.04 in.
39th.	9.98 “	9	19.73 “	30th.	8.15 “	8	16.38 “
38th.	9.71 “	16	19.46 “	29th.	7.87 “	6	15.4 “
37th.	9.39 “	20	18.83 “	28th.	7.56 “	4	15.7 “
36th.	9.32 “	18	18.83 “	27th.	7.37 “	4	14.15 “
35th.	8.78 “	20	18.44 “	26th.	6.9 “	4	
34th.	8.97 “	11	17.96 “	25th.	7.1 “	1	
33d.	8.66 “	10	17.12 “	24th.	5.07 “	1	
32d.	8.39 “	13	16.09 “				

Proportion Between Height of Uterus, and Length of Intra-Uterine Fœtal Axis, and Length of New-born Infant.

Week of pregnancy.	Height of Uterus.	Length fœtal axis, (intra-uterine.)	Length new-born infant.	Week of pregnancy.	Height of Uterus.	Length fœtal axis, (intra-uterine.)	Length new-born infant.
40th.	10.18 in.	9.98 in.	19.6 in.	31st.	8.42 in.	8.46 in.	17.04 in.
39th.	10.02 "	9.98 "	19.73 "	30th.	8.38 "	8.15 "	16.38 "
38th.	9.7 "	9.71 "	19.46 "	29th.	7.87 "	7.87 "	15.4 "
37th.	9.5 "	9.39 "	18.83 "	28th.	7.91 "	7.56 "	15.7 "
36th.	9.4 "	9.32 "	18.83 "	27th.	7.44 "	7.37 "	14.15 "
35th.	9.16 "	8.78 "	18.44 "	26th.	7.41 "	6.9 "	
34th.	9.12 "	8.97 "	17.96 "	25th.	6.95 "	7.1 "	
33d.	8.7 "	8.36 "	17.12 "	24th.	5.85 "	5.07 "	
32d.	8.5 "	8.39 "	16.09 "				

The importance of these researches is at once appreciated. The age of gestation and the volume of the fœtus being known, there remains simply the other element, the dimension and the form of the pelvis. Let us say here, once for all, that delivery being always more difficult in the generally and regularly contracted pelvis than in the simply flattened or not, it will be necessary to interfere in this case earlier.

1. *Pelvis at least* 3.5 *inches.*—There is a difference according as we are dealing with a primipara or a multipara. In the latter everything depends on how the previous labors have passed. If, at term, they have been simple, easy, and resulting in living infants, we need not induce labor, but can wait; if the forceps has been required, although easy and with living infants, we must be more reserved. We must never forget what we have already stated, that infants increase in size with the pregnancies, especially boys; and consequently in the fourth and fifth pregnancies we might meet with difficulties which did not exist in the others. We are, therefore, justified in inducing labor a little before term. With all the more reason, of course, if the woman is in the habit of bearing large children, if on palpation and on mensuration we suspect a large child, if the anterior labors have necessitated the forceps, resulting in dead children, or if the forceps has not sufficed, and the fœtus has had to be mutilated.

When the pelvis is at least 3.5 inches, after deduction, and the fœtal head at term will be 3.7, reducible by .39 of an inch, labor should be induced at eight months one week to eight and a half months, according to the obstacles met with in previous labors, and the supposed volume of the fœtus.

If, on the other hand, we are dealing with a primipara, since infants are usually smaller, we may wait till term, or at least not induce labor till eight or ten days before term.

2. *Pelvis of* 3.31 *inches.*—In this case, whether we are dealing with a primipara or a multipara, premature labor is indicated, and at eight months to eight and a half.

3. *Pelvis of* 3.12 *inches.*—Premature labor is to be induced between eight and eight and a half months at the latest.

4. *Pelvis of* 2.9 *inches.*—Premature labor is to be induced between seven and a half and eight months.

5. *Pelvis of* 2.73 *inches.*—Premature labor is to be induced between seven months and seven months three weeks.

6. *Pelvis of* 2.53 *to* 2.34 *inches.*—At seven to seven and a half months at the latest.

Below 2.34 inches, miscarriage should be induced; instances where in pelves of 2.14 inches living children have been obtained are very exceptional, and cephalotripsy and embryotomy are too dangerous for the mother.

Indeed, when we are going to induce premature labor, we must not consider this operation alone, for although in pelves of 3.5 to 3.12 inches we can usually extract living infants with the forceps, this is far from being the case where the contraction is less than 3.12 inches. Here we may be able to bring the fœtus down to the pelvic floor, but no further, and be obliged to mutilate it. The greater the contraction of the pelvis, the greater the difficulty of mutilating operations, and hence the less the chances for the mother. It is of advantage to her, therefore, to substitute miscarriage for premature labor.

We see, then, from the above figures, that it is in the most common degrees of deformity, 3.51, 3.31, 3.12, 2.73 inches, that it is, in general, of advantage to induce premature labor, and that the time of election corresponds to about these same figures, since the fœtal head is reducible by .39 of an inch. These divisions, however, are not at all absolute, and the accoucheur must carefully study the obtainable data in each case before resorting to the operation. We must further remember that in rickets both the fœtus and the uterus develop above the brim, since the head cannot engage; and that, consequently, the size of the abdomen will always indicate a more advanced pregnancy than in reality exists. We must always take into account this exaggerated elevation of the fundus, particularly in case of contraction between 2.34 and 2.73 inches. Here premature labor should be induced between seven and seven and a half months at the latest, and since an error of 15 days is possible in our estimation, we will often induce miscarriage, that is to say, not obtain a viable child.

Once having determined on the induction of premature labor, another question presents itself—What is the presentation of the fœtus?

Although, prior to the last few years, cephalic presentations were considered most favorable in contracted pelves, latterly, the experiments of Budin, Champetier, Milne and Goodell, tend to show that the balance is in favor of pelvic presentations, certainly before term. We may well ask, therefore, if it would not be advantageous to convert head into breech by external manipulation? We cannot answer this question at present. Facts are not numerous enough, and the future must decide. The good results from the forceps lessen as the degree of contraction increases; cephalotripsy and embryotomy always sacrifice the fœtus, and become the more dangerous for the mother with increase in degree of contraction. We are, therefore, justified in trying the method of Milne and Goodell, which has yielded them such brilliant results. (See subject of Contracted Pelves, *Forceps and Version.*)

We give below the results of Winckel at the Dresden Maternity, in cases of contracted pelvis.

Of 10,679 labors, from October, 1872, to the end of March, 1882, Winckel noted 300 cases of contracted pelvis with 356 labors; 129 of these women had rickets.

Weidling (Halle) divides his cases according to the number of labors thus:

	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.
147– I. P.	1	14	21	8	10	17	10	34	14	15	3
94– II. P.	2	8	8	5	13	13	6	11	14	11	3
43– III. P.		2	3	3	4	9	5	3	3	3	2
25– IV. P.			5		4	6	2	5	1	2	
18– V. P.	1	1		1	1	5	1	4	2	1	1
13– VI. P.		3		2	2				3	3	
7– VII. P.		1			2		1	1	1		1
3–VIII. P.			1						1	1	
2– IX. P.					2						
2– X. P.			1			1					
1– XI. P.											1
1– XII. P.										1	
356	4	29	39	19	38	51	25	58	39	37	11

Winckel, comparing his figures with the above, obtains the following percentage:

	I. P.	II. P.	III. P.	IV. P.	V. P.	VI. P.	VII. P.	VIII. P.	IX. P.	X. P.	XI. P.	XII. P.
Labor with pelvic contractions, ...	44.6	24.8	10.5	6.3	4.7	4.1	1.9	.6	.6	.6	.3	.03
Total number of labors,	51	27.6	10.9	4.	2.3	1.3	.7	.6	.3	.2	.1	.03

As for the influence of pelvic contraction on the presentation of the fœtus, Winckel has noted:

Winckel	Vertex, anterior parietal, ...	7 times.
	Vertex extended, ...	4 "
	Face, ...	12 "
	Brow, ...	3 "
	Pelvic extr.	10 "
	Transverse, ...	6 "
	Brow with prolapse of limbs, . .	6 "
	Prolapse of cord, ...	37 "
	Cephalic presentations, . . .	27 "

	Vertex.	Anterior parietal.	Face.	Pelvic extremity.	Trunk.
Winckel, .	75.8%	1.9%	1.8%	3.2%	10%
Weidling, .	90.6%	.2%	3.4%	2.6%	1.6%

	Weidling.	Winckel.
Prolapse of limbs, ...	1%	1.7%
" " cord, ...	5.9%	7.7%

Twists in cord. (Winckel.)	Simple, ...	67 times or 82.7%
	Double, ...	9 " " 11.1%
	Triple, ...	5 " " 6.2%

Ordinarily the general percentage is 25 per cent., or taken singly: simple twists 70.4 per cent.; double 10 per cent.; triple 1.6 per cent.

Prolapse of the cord was the cause of death in 33 per cent. of infants, that is, 1.8 per cent. more than in the other cases.

Varieties and Degrees of Contraction. (*Winckel and Weidling.*)

1.	Pelvis with conj. vera 3.7 to 3.5 inches, flattened and ricketty,	181
2.	" " 3.12 " " " .	87
3.	" " less than 3.12 " " " .	18
4.	" generally contracted, ricketty and not ricketty, generally and regularly, generally and irregularly contracted, .	5

5. Pelves obliquely contracted, ...	6
6. " contracted at inferior strait. Lumbo-sacral kyphosis, .	1
7. " olisthetic, ...	2
8. Pelvis contracted with conj. vera 3.7 to 3.5 in. flattened and ricketty, ...	38
9. Pelvis contracted with conj. vera 3.4 to 3.5 in. . . .	44
10. " " " below 3.12 in. . . .	9
11. " " generally, ...	14
12. " " obliquely, ...	1
Total	406

In Winckel's cases, twice the conjugate was but 2.73 in., and once 2.63 inches.

In Weidling's cases, the greatest degree of contraction was 2.73 inches, in two other cases 2.84 inches.

Of Winckel's cases the method of interference in 300, was:

1. Reposition of retroverted uterus, contracted pelvis, pregnancy went to term, ...	1
2. Induced premature labor, (3 children living, 1 mother dead.)	9
3. Reposition of the cord, (3 children saved.)	9
4. Version, (Ritgen's method.)	5
5. Forceps, (2 mothers dead, 4%. 14 infants dead, 4 by perforation; 5 died during first 8 days; mortality 21.3%. Maternal mortality 4%.)	51
6. Version and extraction, (1 mother dead, 3.1%; dead children 6; born alive, died in 11 first days, 3; perforation aftercoming head 7.	31
7. Perforation, (out of 357 labors in contracted pelvis.) . .	48
8. Cephalotripsy, ...	3
9. Cranioclasty, (mortality of mothers, 8, reduced to 6, since two mothers were already *in extremis*. That is, of 32 cranioclasties, maternal mortality 18.7%. 36 women were sick during the puerperium, of which number: recovered 12, died 20.)	32

Therefore: morbidity 10.6%; mortality 6.8%.

Maternal Deaths. (*Winckel.*)

Uterine rupture at entrance into clinic	2
" " " "	6
Puerperal septicæmia, ...	9
Other diseases, ...	3

Of 100 women with contracted pelvis, 8 died. (*Weidling*).

Winckel notes these facts in regard to maternal and infantile mortality: P. Muller lost 7% women; Gonner lost 5.9% women and 66.3% infants; Michaelis lost 45.5% women and 23% infants; Weidling, infants living 74.2%, dead 25.7%.

Winckel, out of 115 dead infants in 357 labors, including one twin labor, as follows:

1.	Macerated (including 1 anencephalous),	3
2.	Perforation,	48
3.	Dead without mutilation,	39
4.	" in first 17 days,	25
	Total,	115

Comparing then the infantile mortality, according to primiparity and multiparity, the following figures are given:

	Winckel.	Weidling.
I-para,	45:147=30.6%	32.2%
II-paræ,	26:95 =27.7%	27.3%
III-paræ,	12:43 =27.5%	23.1%
IV-paræ,	5:22 =22.7%	17.6%
Multi-paræ,	14:44 =31.8%	26.1%

	Fœtal mortality.	Maternal mortality.
Winckel,	29.6%	1:72 labors.
Weidling,	25.7%	2:47 "

Out of 210 spontaneous labors, in contracted pelves:

Fœtal mortality, (Dresden Clinic.)	17.6%
Maternal " "	2.4%

Out of 308 at the Halle polyclinic: fœtal mortality 12%; maternal mortality 1.3%.

Winckel concludes that we should only interfere when this is absolutely called for, and resuming his practice he gives the following rules, which agree with those given by Spiegelberg:

Wait, as long as the spontaneous passage of the head seems possible and without danger.

Resort to the forceps, even when the head is not engaged, as soon as the life of mother or child is in danger; if the forceps does not quickly succeed, perforate and extract with the cranioclast.

If the head engages badly, or remains movable, resort to version and extraction.

In agreement with Spiegelberg, Winckel holds fœtal life cheap compared to the mother's, and with him also agrees that any intervention is dangerous compared to spontaneous labor.

His clinical results accord absolutely with Spiegelberg's:

Breslau clinic, maternal mortality 7.9 per cent, fœtal 30 per cent. Dresden clinic, maternal mortality 6.0 per cent, fœtal 29.6 per cent.

The time for induction having been chosen, it remains to choose one from the numerous effective agents. The different agents may be divided as follows:

1. Excitation of uterine contractions by the internal administration of drugs:
2. Excitation of the uterus either directly, or by reflex action:
3. Peripheral irritation of the cervix:
4. Direct dilatation of the cervix:
5. Excitants placed between the ovum and the uterine walls.
6. Separation and perforation of the membranes.

I. *Internal Medicines.*—In this series are found all the drugs reputed to be abortifacient: Rue and sabine, which act only in toxic doses, and should hence be excluded; ergot, used latterly by Bongiovanni, and, although rarely powerful enough, even in large doses, to awaken uterine contractions, acts profoundly on the fœtal circulation, often stops it and thus acts contrary to the end we have in view, without speaking of the accidents it may occasion to the mother at the time of delivery. The sulphate of quinine recommended by Sayre. [This drug has absolutely no power of awakening uterine contractions, else how may it be given in large doses to the gravida suffering from intermittent fever with none but good results? When once contractions are in progress, however, there is no question but that a large dose intensifies them.—Ed.]

Recently pilocarpine has been recommended. It has been studied in particular by Müller, Dick, Fehling, Prochownick, Kleinwächter, Bidder, Stroynowski, Mossmann, Schauta, Felsenreich, Welponer, Scotti, Ohms, Marmi, Labarraque, and it has been used to induce labor by Sänger, Parisi, Hyernaux, John Clay, Ercole Pasquali, Chantreuil, Mari-Autet, Kroner. The following are Mari-Autet's conclusions: 1. In a certain number of cases pilocarpine subcutaneously has had no effect (Welponer, Parisi, Hyernaux and Sänger); 2. The same is true of a number of experiments on animals (Hyernaux, Chantreuil); 3. When, however, the woman is in labor, or has reached term, the subcutaneous injection has an effect, also in animals; 4. In a certain number of cases, the contractions observed after injection have determined labor (Massmann, Schauta, Kleinwächter, Sänger); 5. Usually the action has been insufficient to determine the expulsion of the product of conception; 6. It appears legitimate to conclude, that if at term and during labor pilocarpine seems to have influence over the contractility of the uterus, before term the action is *nil* as regards the induction of premature labor.

Autet, however, fails to mention what others have, that pilocarpine produces symptoms of poisoning, and only acts in the presence of these symptoms, a fact brought out strongly by Sänger, Kroner, and Hyernaux. The last gentleman attributes the oxytocic effect of pilocarpine, not to a special action of the alkaloid, but to its toxic property. It is an epiphenomenon of the great disturbance it causes in the organism. He compares it to the labor which follows on heart disease, profound emotion, or nervous shock, the convulsions of epilepsy and hysteria, (Wasseige.) We must hence absolutely reject pilocarpine.

[The binoxide of manganese, which has of late proved of such great utility in atonic amenorrhea, would seem to possess marked oxytocic properties, certainly in the early months of pregnancy. We are personally cognizant of three cases, where the drug was administered by others during pregnancy, with resulting miscarriage. Possibly in the later months of gestation, it will not so act, but it is well to bear in mind the fact that it may evoke uterine contractions.—Ed.]

II. *Direct and reflex Excitation of the Uterus.*—D'Outrepont advised friction and massage of the uterus. Schreiber has used galvanism; Dorrington and Simpson electro-magnetism; Henning faradism; Gardien hot baths frequently repeated; Friedereich blisters to the mammæ; Scanzoni, Langenreich, Germann, rubber suction bulbs on the nipples. Aside from the fact that many of these methods are painful, and even dangerous, they are all untrustworthy, and lead but slowly and rarely to the proposed end.

[The recent contributions of Bayer and Fleischmann, amongst others, would lead us to think that in the electric current we possess a most valuable means of inducing premature labor, and safer than many others in use, for the reason that all possible chance of infection is avoided. In

Fleischmann's cases the effect was most marked when the cathode lay in the posterior *cul-de-sac*, and the anode was placed over the lumbar vertebræ. He suggests as possible that the contractions are evoked through irritation of Frankenhauser's ganglion. Personally, we propose to try electricity when occasion offers, and preferably the faradic current, mild of course, and with the precaution of not passing the current through the poles of the fœtal ovoid. Our belief in the action of this current is based largely on the results yielded us in two cases of uterine inertia, to which we have already referred. Likely enough the interrupted galvanic current would act as well as the faradic.—Ed.]

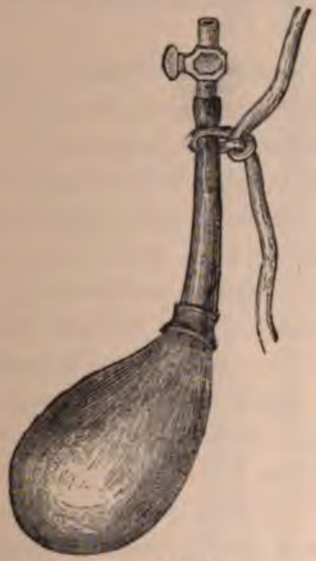

FIG. 125.—BRAUN'S COLPEURYNTER.

III. *Excitation of the Periphery of the Cervix.*—Schoeller has proposed the tamponade of the vagina with pieces of charpie, as in case of hemorrhage, and has thus been successful twelve times in twenty. Hüter and Busch, instead of using charpie, tampon with a bladder containing an infusion of ergot, destined to act by exosmosis!!! Braün uses the colpeurynter (Fig. 125), and it has succeeded in a number of instances.

IV. *Douches.*—Kiwisch has advocated hot douches against the cervix, at a temperature of 110° F. continued for twelve to fifteen minutes. Scanzoni has proposed the substitution of intravaginal douches of carbonic acid. Giordano cauterizes the cervix with the stick of nitrate of silver.

V. *Dilatation of the Cervix.*—Busch, Mende, and Krause, have used metallic dilators. Kluge introduces into the cervix a cone of prepared sponge (Fig. 126), and holds it in place by a vaginal tampon. This sponge softens, swells, dilates the cervix, and awakens uterine contractions. Van Leynseele, and Pigeolet, replace the sponge by laminaria tents. [If a tent is to be used, the tupelo should be preferred to the sponge and the laminaria. The danger from septic infection is too great from the sponge, however carefully prepared, and it should never be used in the gravida for this reason. The laminaria wounds the cervix too much, and in this way exposes to septic infection. The tupelo is not open to either of these objections, dilates evenly and just as thoroughly, and is the tent *par excellence.*—Ed.]

Snackenberg uses an instrument which he calls the *spheno-siphon.* It is composed of a syringe and canula about two inches long, pierced with lateral holes, and covered with prepared skin which will distend to the extent of one to two inches. The syringe is filled with liquid, the canula inserted into the cervix, the piston pushed down, and the skin bladder distended with fluid. A screw holds the piston in place. On the following day more fluid is injected, and similarly on the third day.

Barnes has devised a method which not only allows him to determine labor, but to accelerate it, and to end it, so to speak, at will. His apparatus consists of three rubber bags of different sizes, shaped like a violin, and adapted to each there is a long rubber tube fitted with a stopcock. The smallest of these bags is .78 to 1.1 of an inch, the largest 2.34 to 2.79 inches. Barnes begins by obtaining a certain amount of dilatation through the douche or by the prepared sponge; then he inserts his smallest bag, and distends it with warm water. When dilatation is sufficient, the bag slips into the vagina, he withdraws it and inserts the next size, and later the largest, and, when dilatation is complete, he ruptures the membranes, and terminates labor by either forceps or version, generally the latter. Barnes has recently modified the procedure. Over night he inserts a bougie, 5.8 inches deep, and leaves it there. In the morning, dilatation having commenced, he inserts the small bag, ruptures the membranes, continues the dilating process with the second and third bag, and ends the labor by version, as soon as the cervix is sufficiently dilated.

Chassagny has devised a double bag, analogous to Barnes's dilator, except that each bag is provided with an independent tube, so that one or both may be inflated indifferently.

Deviliers used a double current catheter, the end of which was covered with a species of condom which, when in the cervix, is distended with water.

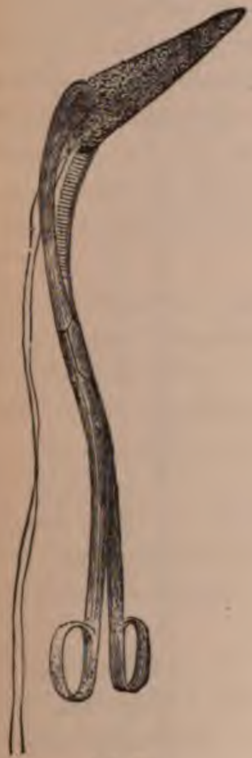

Fig. 126.

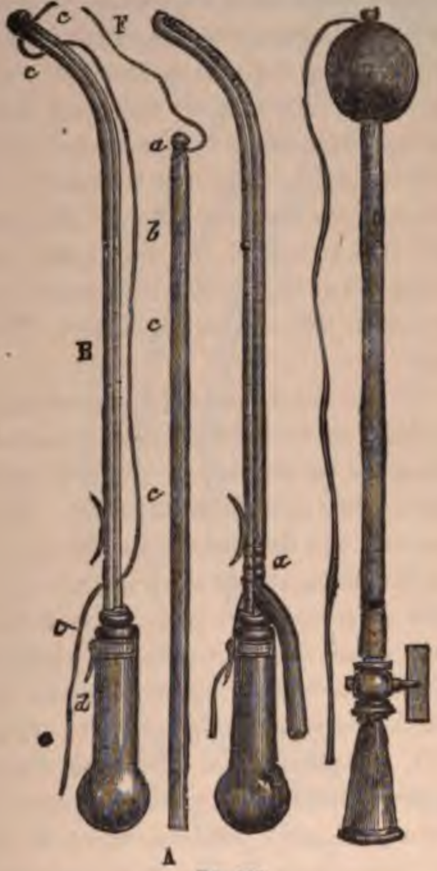

Fig. 127.

Fig. 126.—Kluge's Method. Introduction of Sponge Cone

Fig. 127.—Tarnier's Dilator.

Mattei has devised a similar instrument.

Tarnier, finally, has devised his dilator, which he describes as follows (Fig.127): "The instrument is composed of two portions—a rubber tube and a conductor. The principle of its action is to insert into the uterus, above the internal os, a rubber tube of the size of a bird's feather, which swells at its uterine extremity into a bladder the size of an egg when it is distended. It is left in *situ* till expelled by the uterine contractions. The rubber tube is 11.5 inches long, and closed at one end. The walls are thick and resisting, becoming thin at their extremity. When injected, the unequal thinness of the walls causes them to distend at this portion. To the end of this tube is attached a strong thread, 19.5 inches long. The conductor is metallic, tunnelled throughout its length, and curved like the hysterometer. It is pierced by three eyelets, two at the end, .39 inches apart, the third near the handle. To mount the tube on the conductor, I pass the thread through the eyelet nearest the extremity; it is then passed through the next eyelet, and it runs down the gutter to emerge out at the eye near the handle. By making traction on the thread the tube is held on the conductor. The thread is twisted around the screw.

"To use this instrument I proceed as follows: It is guided by two fingers into the cervix between the ovum and the uterine walls, at least one inch above the internal os. Fully an ounce of liquid is injected, and the tube becomes sufficiently distended. The stop-cock is closed, the thread unwound, and the conductor withdrawn. The tube will remain in place, and the woman should move around and attend to her household duties. Labor pains rapidly set in, in three to four hours the cervix opens, and the tube falls into the vagina. This happens in about ten to twelve hours."

Pajot has modified Tarnier's dilator by replacing the conductor by a small hollow tube ending in a bulb. (Fig. 128).

VI. *Excitants placed between the Uterine Walls and the Ovum.*—Tarnier's apparatus not only acts as a dilator, but also as an excitant. Krause uses a gum-elastic catheter, which he inserts between the membranes and the uterus, and leaves it in place until the uterine contractions have brought about sufficient dilatation of the cervix. Zuidhoeck used a wax bougie. Mampe and Lehmann are satisfied with introducing a bougie several times between the membranes and the uterus, in different directions.

VII. *Separation and Perforation of the Membranes.*—Schweighauser and Cohen have advised inserting between the membranes and the uterus an elastic catheter to which a syringe is fitted. Through this water is injected, which separates the membranes and awakens contractions. Hamilton recommends simply passing the finger above the internal os, and separating the membranes as high up as possible from the lower uterine segment. This method has been partially practised by Copeman in case of uncontrollable vomiting. Finally Scheel, Hopkins and Meissner, have counselled perforation of the membranes by means of a pointed feather trocar, or the uterine sound. Kluge and Ritgen have devised instruments, the aim of which is to suck down the membranes into the opening of the canula, and there perforate them. The advantage of this method is that the *liquor amnii* escapes by drops. (Fig. 129.)

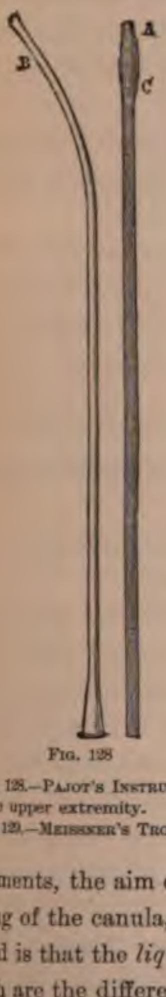

FIG. 128

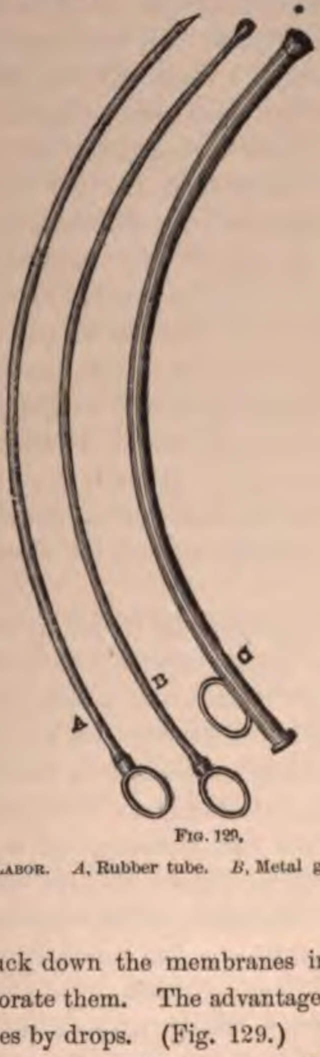

FIG. 129.

FIG. 128.—PAJOT'S INSTRUMENT FOR INDUCING LABOR. *A*, Rubber tube. *B*, Metal guide. *C*, Dilatable upper extremity.

FIG. 129.—MEISSNER'S TROCART.

Such are the different methods in use to-day. All have not the same value, and we proceed to point out the advantages of each, and our own preference.

At the outset, we eliminate internal drugs, since their action is untrustworthy or *nil*, and when they do act they compromise the mother's health and the fœtal existence. The same remark holds for frictions and massage, the action of which is, at best, but transitory; excitation of the mammæ, which, aside from the fact that they are very painful, often fail; electro-magnetism, galvanism, etc.

[From what we have said before, we take exception to this exclusion of electricity. We believe that this agent will prove the most effective, and the least dangerous, seeing that uterine contractions can with absolute certainty be evoked, and with not the slightest risk of septic infection or damage to the cervix or the uterus.—Ed.]

Amongst the active measures, we mention the tampon. It often succeeds, especially in case of hemorrhage, but its application is painful, slow, and it must be renewed on account of its odor.

[That the action of the tampon is slow we grant, but, when inserted, as only it should be, in Sims' position and through Sims' speculum, it is not at all painful, simply uncomfortable; and, as for its frequent removal, if iodoform gauze is used, it may be left *in situ* for thirty-six hours, in case of necessity. A practical point in connection with the tampon, is not to fill the lower third of the vagina, and thus avoid pressure on the neck of the bladder and the urethra, with the consequent tenesmus.—Ed.]

The measures most frequently resorted to are those of Kluge, Kiwisch, Barnes, Tarnier, Krause, Cohen, Scheel and Meissner.

Kluge's method, that is to say, dilatation of the cervix with prepared sponge, or with laminaria, is certainly an excellent one. First proposed by Brunninghausen, later by Siebold, it was especially practised by Kluge, and is called after him. Dilatation of the cervix is thus accomplished slowly and with certainty, and the sponge acts mechanically as well as dynamically, without risk for the mother or the child. It leaves the membranes intact, and thus the mother and the child remain under normal conditions. The introduction of the tent is, however, often very difficult. In primiparæ, in particular, where the cervix is high up and behind, it is difficult to insert and to retain in place. Often, further, the tent acts so very slowly that we are obliged to perforate the membranes, thus depriving the fœtus of a portion of the benefits of the operation. In 70 cases collected by Hofmann it was successful 50 times alone; 7

times other methods had to be joined to it; 7 times it absolutely failed. Let us add, finally, that there is some risk of septic infection following its use, and this is truer still of laminaria. Nevertheless, the method is a good one, especially in multiparæ.

Kiwisch's method, the hot douche, also succeeds well. Used first in Germany by Kiwisch, in 1846, it was imported into France in 1852, by Campbell, who told P. Dubois about it. The method has become classic with us. Dubois used it with an irrigator containing 2½ gallons; Depaul either with the irrigator or the bulb syringe. Blot directed the stream against the os, and even proposed to inject into the canal, when, in the hands of Depaul, of Salmon, of Blot, of Tarnier, of Simpson, of Olshausen, of Lazatti, and of Van Leynseele, there occurred cases where women died during the douche, as the result of the entrance of air into the uterine sinuses. Tarnier showed further that with the powerful syringe of Mattieu the vaginal *culs-de-sac* might be torn. From this time forth Kiwisch's method was abandoned.

Barnes' method is not simply one for the induction of labor, but is a variety of *accouchement forcé*, and should be reserved for exceptional cases.

Tarnier's method is to-day the favorite in France; it has decided advantages over all the others, but it is not, as Tarnier says, proof against objection. As Tarnier himself admits, it is often difficult, if not impossible, to introduce the dilator, and in primiparæ the conductor is too large. The rubber tube may break, "and then involuntarily we inject into the uterus." In multiparæ, especially, we have seen the instrument slip before dilatation was completed, and been obliged to reinsert it as often as four times. Hence loss of valuable time. Nevertheless, the method is a valuable one, not dangerous to mother or child, and usually rapid and successful.

Cohen's method is a good one, but is little used, because, like Kiwisch's, it exposes to the entrance of air into the uterine sinuses, and to sudden death of the mother.

There is one method which we prefer over all, and this is Krause's. It is simple, efficacious, harmless. It consists in inserting a gum-elastic bougie between the membranes and the uterus, and leaving it *in situ* until dilatation is sufficient, and contractions regular enough to warrant the belief that labor has really set in. We have used the method twelve times without a failure. We take a bougie, 17 to 18 french. The woman is placed across the bed, and two fingers of the left hand are introduced into the vagina to the cervix, and placed underneath the external os. These fingers guide the bougie into the uterus, and it is gently pushed inward, being withdrawn a little in case it meets any obstacle, and then pushed in again. In general, labor sets in at the end of a few hours, and the bougie is left *in situ* until dilatation is completed.

This method, we see, is the simplest of all. Mampe, Lehmann, Earle, have simplified the method by moving the bougie in different directions, and thus separating the membranes, and then withdrawing it. Lehmann has succeeded in a number of instances. Valenta recommends pushing the bougie to the left, and behind, because: 1. The placenta is rarely on this side; the presentation of the occiput to the left being the most frequent of all, the bougie slides readily over the smooth occiput and the back, without risking rupture of the membranes; the uterus being dextro-verted, catheterism is easier on the left. With Hüter we believe that these rules are purely theoretical.

The opponents of Krause's method make the following objections: 1. The insertion of the bougie is difficult, seeing that it bends and stops before penetrating sufficiently into the uterus. Far from finding this an objection, we believe it to be a safeguard. It is impossible with an elastic instrument like the bougie to injure the uterus or the fœtus, and admitting that we cannot make it pass to the fundus, we may always, by acting gently and slowly, place it in the lower uterine segment, where it will bend and produce the desired effect. 2. We may rupture the membranes. This objection is not, to us, founded on fact, for the bougie, sliding gently between the membranes and the uterus, simply separates them, and it is later, under the influence not of the bougie, but of the uterine contractions, that the membranes rupture. If the membranes are not ruptured by Tarnier's metallic guide, with greater reason will they not be by the bougie. 3. The bougie does not only excite the uterus, but irritates and inflames it, and further there may adhere to it septic matter, or else it may itself alter and give rise to septic products which will poison the woman.

These objections seem to us more theoretical than practical, and, in not a single one of the twelve cases in which we have used Krause's method, have we seen any accidents. In one case it remained in the uterus twenty-eight hours, and was withdrawn unaltered. Further we always take the following precautions: We irrigate the vagina with a 1 to 100 phenic acid solution, and wash our hands and the bougie in the same fluid, and we grease it with carbolized vaseline before introduction. Whilst it is in place, the woman injects herself every five to six hours with warm carbolized water.

Certain authorities, nevertheless, with Hegar at their head, fear septic infection so much that they always resort to the next method, that is to say, puncture of the membranes. Whether we rupture them at the internal os, or higher up, the result is the same, labor is induced, for the ovum has been torn. This, it may be said, is the only inevitable means of inducing labor. The method, however, has its disadvantages, and it should be reserved for cases where the bougie fails, and then we would perforate at the internal os, and not higher up.

We may make the following objections to perforation: 1. It acts slowly, the more so the higher up it is done. Indeed labor may not set in for as much as twenty-four to forty-eight hours or longer, when we remember what may happen in case of spontaneous rupture of the membranes. We have just seen a case where labor only set in forty-four days after spontaneous rupture at the seventh month of gestation, and we might mention others. 2. The perforation of the membranes, by evacuating the liquor amnii, places the mother, and above all the fœtus, in less favorable conditions than all the other measures where the liquid is retained. And this is why Meissner and Hopkins advised perforation high up, in order that the *liquor* might escape slowly, and thus preserve as long as possible the cavity of the ovum.

Prognosis.—Considered alone, the induction of premature labor being an operation practised in the interests of the mother and of the child, is inoffensive, and all the more so when performed by an expert. But, in studying the different methods, we have seen that several have caused the death of the mother, and that therefore the choice of the method is not a matter of indifference. The most inoffensive, in our opinion, are those of Kluge, of Tarnier, and of Krause, and then follow the method of Kiwisch, and the perforation of the membranes, the latter compromising especially the life of the fœtus. We must further consider the operation from the standpoint of its results for the mother and the child, particularly in connection with pelvic deformity. In this case, indeed, the induction of labor is purely preparatory to true labor, so to speak, and the operation does not always save the child from forceps, perforation, or embryotomy, with all the consequences of these operations for the mother and for the child.

Hecker, in giving the results of the labors at the Munich Maternity from June, 1859, to March, 1879, tells us that in 17,220 labors with 17,400 infants, interference was necessary in 1,424 cases, as follows:

Induction of premature labor,	24
Cephalic version,	6
Podalic “ (1 foot)	202
Extraction, simple,	210
“ after version,	189
“ “ forceps,	446
“ “ perforation,	30
“ “ cephalotripsy and cranioclasty,	26
Cæsarean section : living women, 2; dead women, 3,	5
Reposition of the cord,	76
Artificial third stage,	210

Of the 17,220 women, 279 died, or 1.6%:

During or immediately after labor,	24
“ the puerperium,	80
After leaving hospital,	175

Of the 17,400 infants, 1,715 died, or 9.8%:

Dead before labor,	407
“ during labor, or born in apparent death and not re-animated,	540
“ from congenital weakness,	435
“ “ disease,	333

Certainly the induction of premature labor is an immense progress; for as Naegelé and Grenser say, “the proportion of fatal cases is not great, if compared with the operations which would have been required, other things equal, by the mother at term. As for the children, the prognosis is less favorable, for being born prematurely they are much more difficult to rear than at term.”

But we must remember that the induction of premature labor is called for precisely because the woman is in unfavorable circumstances, and we may say then that the prognosis of the operation is always grave, especially since it may be followed by other operations. The operation, then, will give results the less favorable the greater the degree of pelvic deformity, and the earlier in gestation we are obliged to resort to it.

Spiegelberg and Litzmann, followed by Berthold and Fritsch, have, in particular, endeavored to weigh the results from the induction of premature labor.

"Spiegelberg first establishes the fact that the operation has attained its present high reputation, because: 1. The comparative risks of the operation have never been stated. 2. Those children have been considered definitively saved who were born alive at the end of the operation. He then examines the results of his personal experience and of that of others, and he finds that at Frieburg, between 1865 and 1869, there were 2,264 labors, with 307 cases of pelvic deformity, the contraction varying between 2.34 and 3.75 inches, and including 11 cases of pelves regularly and generally contracted, 3 obliquely and 1 transversely contracted. The following are the points of interest in connection with these 307 labors:

The presentations were divided into: Vertex 257; face 8; brow 1: breech 11; shoulder 30.

There were 165 spontaneous labors, and 142 induced labors, with the following results as regards maternal and infantile mortality:

By expectant treatment:—Mothers saved, 94.5%; infants saved, 64.8%.

By interference:—Mothers saved, 93.4%; infants saved, 62.8%.

Next, considering the statistics of different German authors, he obtains the following figures:

a. Result in 1,124 labors in contracted pelves, taken generally:

Mothers saved, ...	1,143—93.3%
" dead, ...	81— 6.6%
Infants saved, ...	880—71.2%
" dead, ...	355—28.7%

b. Results in 271 cases of artificial labor, taken *en masse:*

Mothers saved, ...	220—81.1%
" dead, ...	41—18.8%
Infants saved, ...	94—33.9%
" dead, ...	92—33.2%
" " after labor, . .	91—32.8%

c. Results in 219 cases of induced labor, contracted pelves:

Mothers saved, ...	186—84.9%
“ dead, ...	33—15.0%
Infants saved, ...	73—33.0%
“ dead, ...	77—34.8%
“ “ after labor, . .	71—32.1%

d. Results in 587 cases of spontaneous labor, contracted pelves:

Mothers saved, ...	549—95.5%
“ dead, ...	38— 6.4%
Infants saved, ...	383—64.9%
“ dead, ...	207—35.0%

e. Results in 239 cases of very pronounced contraction (1.17 inches and below):

Mothers saved, ...	205—85.7%
“ dead, ...	34—14.2%
Infants saved, ...	100—41.4%
“ dead	141—58.5%

Spiegelberg, therefore, pronounces himself in favor of expectancy as against induction of premature labor.

Gierich, in 110 cases collected from different authorities, gives the following figures:

In 110 cases of induced premature labor:

Mothers saved, ...	84—76.3 %	
“ dead, ...	26—23.63%	
Infants saved, ...	35—31.8 %	
“ dead	29—26.36%	68.18%
“ “ after labor, . .	46—41.81%	

The same authority in 793 cases of contraction down to 2¼ inches, and where consequently there was no question of premature labor, noted:

Mothers saved, ...	746—94.07%
“ dead, ...	47— 5.92%
Infants saved, ...	402—75.1 %
“ dead, ...	199—24.8 %

Litzmann, finally, reaches the results found in the subjoined tables:

Table I.—Results in 373 Cases of Labor in Contracted Pelves.

Pelvis regularly and generally contracted, 73, or 19.5%. Pelvis simply flattened, 194, or 52.5%. Pelvis generally contracted and flattened, 104, or 27.8%

	Number of Labors.	Presentation of Fœtus.	Progress of Labor.		Mothers.		Infants.		
			Natural. (¹)	Artificial.	Saved.	Dead.	Born Alive.	Dying or Born Dead.	Living.
1. Labor at term....	323 86.5%	Vertex ....279=86.3% With Prolapse of Cord...... 18= 5.5% With Prolapse of Limbs.... 2= 0.6% Face.......................... 2= 0.6% Pelvis........................ 18= 5.5% Shoulder.................... 4= 1.2%	227 70.2%	96 29.7%	302 93.4%	21 6.5%	271 83.9%	52 16.19%	264 81.7%
2. Labor before term *a.* Spontaneous	16 4.2%	Vertex .... 8=50.0% With Prolapse of Cord .... 2=12.5% With Prolapse of Limbs.... 1= 6.2% Pelvis........................ 4=25.0% Shoulder.................... 1= 6.2%	10 62.5%	6 37%	16 100 %	0 0.0%	11 68.7%	5 32.1%	8 50%
b. Artificial	34 9.1%	Vertex .... 14=41.1% With Prolapse of Cord...... 3= 8.8% With Prolapse of Limbs.... 2= 5.8% Pelvis........................ 9=26.4% Shoulder.................... 6=17.6%	12 35.2%	21² 61.7%	29 85.2%	5 14.7%	15 44.1%	19 55.8%	7 20.5%
Total....	373	Vertex ....301=80.6% With Prolapse of Cord...... 23= 6.1% With Prolapse of Limbs.... 5= 1.3% Face.......................... 2= 0.5% Pelvis........................ 31= 8.3% Shoulder.................... 11= 9.9%	249 66.7%	123 32.9% Not terminated. 1 .8%	347 93.02%	26 6.9%	279 74.7%	76 20.3%	297 79.6%

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[1] In this number are included, prolapse of cord or limbs, tamponade, episiotomy.

[2] One labor not completed.

Table II.—Results in 316 *Cases.*

First degree of contraction:—Pelvis regularly and generally contracted, 3.9 to 3.5 inches=73 or 23.1%. Pelvis simply flattened, 188=59.4%; Pelvis generally flattened and contracted, 55=55.7%—Conjugate of 3.7 to 3.21 inches.

	Number of Labors.	Presentations.			Progress of Labor.		Mothers.		Infants.		
					Natural.	Artificial.	Saved.	Dead.	Born alive.	Dying or Dead.	Saved.
	304	Vertex................	264	86.8%	226	78	289	15	265	39	258
1. Labor at Term...	96.1%	With Prolapse of Cord,	15	4.9%	74.3%	25.6%	95.06%	4.9%	87.1%	12.8%	84.8%
		With Prolapse of Limb,	2	.6%							
		Face..................	2	.6%							
		Pelvic.................	18	5.9%							
		Shoulder..............	3	.9%							
2. Premature Labor	10	Vertex....	7	70%	9	1	10	0	10	0	8
a.—Spontaneous...	3.1%	Prolapse, Cord........	1	10%	90%	10%	100%	00%	100%	00%	80%
		" Limb........	1	10%							
		Pelvic.................	1	10%							
b.—Artificially Induced..........	2[1]	Pelvic........	1	50%		1	1	1	1	1	0
	.6%	Oblique..............	1	50%		50%	50%	50%	50%	50%	00%
Total.......	316				235 74.3%	80 25.3%	300 94.9%	16 5.06%	276 87.3%	40 12.6%	266 84.1%

[1] Mothers not delivered. Dead from entrance of air into veins.

Table III.—Results in Forty-seven Labors. Contraction of Second Degree.

Pelvis simply flattened, 5, 10.6%. Contraction, 3.19 to 2.9 inches. Pelvis generally contracted—flattened 42, 89.3%; Dimensions, 3.51 inches.

	Number of Cases.	Presentation.		Progress.		Mothers.		Children.		
				Natural.	Artificial.	Saved.	Dead.	Born Alive.	Dying or Dead-born.	Saved.
1. Labor at Term....	16 34%	Vertex....................	13=81.2%	1 6.2%	15 93.7%	13 81.2%	3 18.7%	4 25%	12 75%	4 25%
		Prolapse of Cord...........	2=12.5%							
		Shoulder..................	1= 6.2%							
2. Premature Labor, *a*. Spontaneous..	4 2.5%	Vertex....................	1=25%	1 25%	3 75%	4 100%	10	1 25%	3 75%	0 0.0%
		Prolapse of Cord...........	1=25%							
		Shoulder..................	1=25%							
		Pelvic....................	1=25%							
b. Artificially induced.......	27 57.4%	Vertex....................	11=40.7%	11 40.7%	16 59.9%	25 92.5%	2 7.4%	13 48.1%	14 51.8%	7 25.9%
		Prolapse of Cord...........	3= 4.1%							
		Prolapse of Limbs.........	2= 7.6%							
		Pelvic....................	7=25.9%							
		Shoulder..................	4=14.8%							
Total........				13 27.6%	34 72.3%	42 89.3%	5 10.6%	18 38.2%	29 61.7%	11 23.4%

Table IV.—Results in Eight Labors. Third Degree Contraction.

Simply Contracted, 2, 25%; Generally flattened—Contracted, 6, 75% Conjugate, 2.84 to 2.14 inches.

	Number of Cases.	Presentation.	Progress.		Mothers.		Infants.		
			Natural.	Artificial.	Saved.	Dead.	Born Alive.	Dying or Dead.	Saved.
1. Labor at Term....	2 25%	Vertex....................... 1— 50%	0	2 100%	0	2 100%	1 50%	1 50%	1 50%
		Prolapse of Cord .... 1— 50%							
2. Premature Labor. *a.* Spontaneous...	1 12.5%	Pelvic..................... ... 1—100%	0	1 100%	1 100%	0	0	1 100%	0
b. Artificial Labor	5 62.5%	Vertex....................... 3— 60%	1	4	3	2	1	4	0
		Pelvic... .... 1— 20%							
		Shoulder...................... 1— 20%	20%	80%	60%	40%	20%	80%	
Total........	8		1 12.50%	7 87.50%	4 50%	4 50%	2 25%	6 75%	1 12.50%

Table V.—Results in Two Labors. Fourth Degree Contraction.

Generally flattened—Contracted, 2, 100%; Dimensions, 2.14 and under.

	Number of Cases.	Presentation.	Progress.		Mothers.		Infants.		
			Artificial.	Natural.	Saved.	Dead.	Born Alive.	Dying or dead-born	Saved.
1. Labor at Term....	1 50%	Vertex.........................1—100%	0	1 100%	0	1 100%	1 100%	0	1 100%
2. Spontaneous Labor	1 50%	Pelvic.........................1=100%	0	1 100%	1 100%	0	0	1 100%	0
Total........	2		0	2 100%	1	1 50%	1 50%	1 50%	1 50%

Winckel, from 1846 to 1876, induced labor 25 times; one woman was I-para, three II-paræ, two III-paræ. The ages varied between 21 to 45; seven from 20 to 30 years, fourteen from 30 to 40 years, four over 40.

The operation was done:

2 in the 31st week; 10 in the 32d; 12 in the 33d; 1 in the 34th.

It was called for: in 12 by contraction to 2d degree; in 12 by contraction to 3d degree; and in 1 by contraction to 4th degree.

There were 3 twin labors; 7 presentations of vertex, 12 of pelvic extremity, and 8 of shoulder.

The interval elapsing between induction and birth varied from 12 to 168 hours:

In 3 forceps to before-coming head.
6 " " after-coming "
5 external cephalic version.
6 internal podalic "
2 placenta prævia.
3 artificial 3d stage.

Mothers saved, 25; children born alive, 13; 6 dying in first 15 days.

Ultimate results: Children saved, 7; children dead, 14.

Fritsch, comparing the results given by other methods of interference, aside from induction of premature labor, noted:

	Cases.	Children dead.	Mothers dead.
Forceps to head high up, . .	25	13	1
" " " down, . .	256	11	3
Podalic version, ...	144	45	11
Accouchements forcé, . . .	8	2	2
Pelvic extremity :			
Artificial delivery, . . .	113	8	1
Perforation, ...	14	14	1
Third stage, artificial delivery, .	52		3

It is apparent from this table that out of 551 operations where the aim was to save the mother and the infant, 18 mothers or 3.6% died, and 144 children, or deducting 44 dead and macerated before labor, 100, (20%.) In those cases where the infant was sacrificed, and the interests of th mother alone attended to, 66, mortality of 4, 6.4%.

Wiener, of Breslau, has induced labor 16 times. Comparing the re-

From 1862 *to* 1871.

	Application of Forceps, Head high up.						Forceps. Head Engaged.						Podalic Version.						Labor in Pelvic Extremity. Artificial Termination.						Accouchement Forcé.						Operations in Third Stage				Perforation.				Total Number of Operations.				
			In-fants.		Moth-ers.				In-fants.		Moth-ers.				In-fants.		Moth-ers.				In-fants.		Moth-ers.				In-fants		Moth-ers.				Moth-ers.				Moth-ers.			Infants.		Moth-ers.	
	Primiparæ.	Multiparæ.	Living.	Dead.	Living.	Dead.	Primiparæ.	Multiparæ.	Living.	Dead.	Living.	Dead.	Primiparæ.	Multiparæ.	Living.	Dead.	Living.	Dead.	Primiparæ.	Multiparæ.	Living.	Dead.	Living.	Dead.	Primiparæ.	Multiparæ.	Living.	Dead.	Living.	Dead.	Primiparæ.	Multiparæ.	Living.	Dead.	Primiparæ.	Multiparæ.	Living.	Dead.	Operations.	Living.	Dead.	Living.	Dead.
1862....	..	1	..	1	..	1	4	6	10	..	10	..	..	8	5	3	6	2	2	4	4	2	6	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..	27	19	6	24	3
1863....	..	4	2	2	4	..	11	5	16	..	16	..	1	8	4	5	8	1	..	4	2	2	4	..	..	1	..	1	1	..	..	6	6	..	..	2	2	..	46	24	10	45	1
1864....	2	1	1	2	3	..	16	7	23	..	22	1	3	9	7	5	10	2	..	9	5	4	9	..	..	..	..	..	..	..	..	7	6	1	..	..	..	..	54	36	11	50	4
1865....	1	1	1	1	2	..	7	2	8	1	9	..	1	14	7	8	14	1	2	10	6	6	12	..	..	1	..	1	1	..	..	2	1	1	1	1	1	1	43	22	17	40	3
1866....	..	..	..	..	1	..	12	14	19	7	26	..	..	16	6	10	16	..	3	7	7	3	9	1	..	..	..	..	..	..	..	1	1	..	..	..	..	..	53	32	20	52	1
1867....	1	..	1	..	1	..	11	3	9	5	13	1	..	11	6	5	10	1	4	5	8	1	9	..	..	1	..	1	..	1	..	8	7	1	..	2	2	..	47	25	12	43	4
1868....	..	2	..	2	2	..	16	9	19	6	25	..	3	11	9	5	13	1	1	4	3	2	5	..	..	..	..	..	..	..	5	7	12	..	1	..	1	..	59	31	15	58	1
1869....	..	4	3	1	4	..	33	24	53	4	57	..	1	11	4	8	12	..	5	10	13	2	15	..	..	1	1	..	1	..	..	2	2	..	..	1	1	..	92	74	15	92	..
1870....	1	3	2	2	4	..	35	9	39	5	43	1	1	17	11	7	18	..	2	17	18	1	19	..	..	4	2	2	3	1	..	12	12	..	..	2	2	..	103	72	17	101	2
1871....	1	3	2	2	4	.	18	14	32	..	32	..	1	28	13	16	26	3	2	22	21	3	24	..	..	..	..	..	..	..	1	1	2	..	..	2	2	..	93	68	21	90	3
	6	19	12	13	24	1	163	93	228	28	253	3	11	133	72	72	133	11	21	92	87	26	112	1	..	8	3	5	6	2	6	46	49	3	2	12	13	1	617	407	144	595	22

sults for the mothers in these cases with those from spontaneous labor, since 1870, in case of pelvic contraction:

Of 203 labors, in contracted pelvis, there were 10 maternal deaths, 5%; and 36 sick women, 17.7%; divided as follows:

Flattened pelves, 132; of which number: 87 were 1st degree, and 48 were 2d degree.

Generally contracted pelves, 67; of which 20 were 1st degree, 46, 2d degree, and 1, 3d degree. Funnel-shaped pelves, 3; oblique 1.

No. of Cases.		Spontaneous Labor.			Artificial Labor.		
		Cases.	Mortality.	Morbidity	Cases.	Mortality.	Morbidity
			Per cent.	Per cent.		Per cent.	Per cent.
87	Pelves flattened, 1st degree,	75	1.3	14.6	12	8.2	16.6
45	Pelves flattened, 2d degree,	28		25	17	11.8	29.4
132	Flattened pelves,	103	1	17.5	29	10.3	24.1
20	Pelves generally contracted, 1st degree,	16			4	50.	
46	Pelves generally contracted, 2d degree,	22		27	24	16.6	20.8
67	Pelves generally contracted,	38		16	29	20.7	20.7

In the contractions to the third degree, labor is always artificial.

If now these cases be compared with the 16 where labor was induced:

Labor induced 16 cases,	Spontaneous termination, 9.	Flattened pelves, 2 cases. Generally contracted, 6 cases. Oblique pelvis, 1 case.
	Artificial termination, 7.	Flattened pelvis, extraction by trunk, 1 case. Generally contracted, (of which 3 extractions by trunk, 3 by version and extraction), 6 cases.

Three mothers died, 1 after spontaneous labor, 2 after artificial.

Thus: 16 cases, mortality, 6.25%; morbidity, 25%.

Of the children: 16 cases, 10 dead, 7 during labor; 3 soon after; 62.5%

Of the 6 infants remaining: 2 died 5 weeks after, of marasmus; in 2, result not known; 2 still living.

Wiener's conclusions are as follows: "Artificial labor induced in pelves of 3.3 to 2.7 inches compromises the mother more than spontaneous labor. The same perhaps does not hold true for the fœtus, but the advantage to the latter is more apparent than real, since the majority die rapidly after delivery."

We have already given the results obtained at the Paris Maternité and at the Clinic, as deduced from the records by Rigaud and Stanesco.

The induction of premature labor, then, is most likely to succeed the nearer term it is performed—that is to say, the less the pelvis is contracted, and consequently the less active and necessary secondary intervention, and, on the other hand, the greater the development of the fœtus, and ability to exist outside of the uterus.

As for the prognosis, when the pelvis is normal, and the operation is called for by a complication of pregnancy, or a supervening disease, it should always be guarded; for, although, at times, we may thus save the mother and infant, in other cases it will be impossible to save the infant, endangered as it is already by the disease from which the mother is suffering; and often, by adding to the disease the shock of labor, the operation is simply an additional risk, and not only cannot save the mother, but will diminish her chances of survival. It should never be resorted to, therefore, except as a last resort, when we are deprived of all other therapeutic means.

CHAPTER VI.

THE INDUCTION OF MISCARRIAGE.

UNDER the term *induced miscarriage*, we understand the artificial expulsion of the ovum at a time when the fœtus is not able to exist outside of the uterus, is not viable—that is to say, before the twenty-eighth week of gestation.

The induction of artificial labor in case of pelvic deformity naturally led to the thought of the induction of miscarriage in cases of extreme pelvic contraction. It was also in England, in 1768, that W. Cooper, Barlow and Hull counselled miscarriage in place of the Cæsarean section. From 1774 on, the induction of labor and of miscarriage rapidly spread throughout Germany, Holland and Italy. France alone rejected both procedures, and although, in 1831, Stoltz practised the induction of premature labor, it was not till 1842 that P. Dubois, publicly at the Clinic, induced miscarriage in a case of contracted pelvis. The method was accepted by Cazeaux, Lenoir, and others, but still was rejected by many, and to-day the induction of miscarriage is accepted in principle, although its two most decided opponents, Stoltz and Villeneuve, of Marseilles, reject it in case of contracted pelvis, where they prefer the Cæsarean section, and authorize it in other instances, such as uncontrollable vomiting.

To-day the question is definitively settled, and, as Devilliers justly says, "although, with us, civil and religious law does not make any distinction between criminal and medical miscarriage, yet the magistrates, on weighing the facts of an induced miscarriage, cannot, in justice, apply the penalties of the law. This is why the physician should never act except under the advice of experienced counsel. Still, if at the moment of sacrificing the fœtus, his hand stops from conscientious motives, he may smother these, for both the sacred text and the college at Rome have given an affirmative answer to the question."

As we have stated above, the principle of induced miscarriage is admitted to-day, and authorities only differ in regard to the indications, some deeming it justifiable when the mother's life is in danger from the fact of pregnancy, or of its complications, but excluding carefully pelvic deformity where they advise the Cæsarean section; others include contractions of the pelvis.

As for us, in accord with our teachers, we admit not only that we may, but also that we ought to induce miscarriage: 1. Whenever pelvic contraction is considerable, that is to say, below 2.34 inches; when the infant cannot be delivered by the forceps, and when embryotomy is so difficult as to compromise the life of the mother. 2. Whenever during pregnancy, either from this fact alone, or from intercurrent disease, the life of the mother is in danger, and the interruption of pregnancy would seem to deliver her from danger. In a word, between the fœtal and the maternal existence we would never hesitate.

Miscarriage should be induced: 1. In case of extreme pelvic deformity, under 2.34 inches. 2. Where the pelvis is obstructed by tumors which can neither now, nor later, be removed or pushed out of the way. 3. In uncontrollable vomiting. 4. In uterine retroversion. 5. In hemorrhages, profuse, and endangering, either immediately or from recurrence, the life of the mother. 6. In every case where the life of the mother is endangered, (hydramnios, ascites, circulatory or pulmonary affections, etc.) We will examine each of these indications separately.

Extreme Pelvic Deformity.—The opponents of the method, in these instances, base their views on the results obtained from cephalotripsy and the Cæsarean section, in particular the latter. It suffices to glance at statistics to see how disastrous these operations are for the mother and the infant, cephalotripsy necessarily killing the fœtus even as does miscarriage, and the Cæsarean section giving less satisfactory results than is ordinarily supposed.

As regards cephalotripsy, De Soyre, in his thesis, gives the following figures:

Pelves of less than 2.15 inches:

Lauth.—16 cases: mothers saved, 9; mothers dead, 7.
Gueniot.—4 cases: mothers saved, 1; mothers dead, 3.
Pajot.—7 cases: mothers saved, 5; mothers dead, 2.
Rigaud.—2 cases: mothers saved, 1; mothers dead, 1.
Stanesco.—3 cases: mothers saved, 2; mothers dead, 1.

De Soyre.—20 cases mothers saved, 13; mothers dead, 7.

That is, of 52 cases: 32 recoveries, 20 deaths, 38.46 per cent.

From the Cæsarean section, the results are scarcely more brilliant:

Kayser.—338 cases: mothers saved, 128; mothers dead, 210.

Murphy.—477 cases: mothers saved, 176; mothers dead, 301.

Baudelocque, *Michaelis*, *Velpeau*, *Sprengel*, *Simonart*,	Hubert de Louvain, 1,274 cases.	Mothers saved, 554. Mothers dead, 720.
Churchill, *Figueira*, *West*, *Constantin*,	Joulin, 1,785 cases.	Mothers saved, 844. Mothers dead, 941.

Guéniot cites the following figures, which formally contradict one another: 77 cases—mothers saved, 47; mothers dead, 30. 69 cases—mother saved, 5; mothers dead, 64.

Finally, as De Soyre says, we must take into account the infantile mortality after the Cæsarean section. From Joulin's table, borrowed from Churchill, West, Kayser and Constantin, of 1,050 operations, 352 children were dead, 35.5 per cent.

Therefore, if miscarriage always sacrifices the infant, it saves the majority of women at least, and we do not think there is scope for hesitation.

Still, we must make a distinction between pelves deformed by rickets and by tumors and osteo-malacia. In the latter, indeed, the bones, in certain cases, are so flexible and supple, that, as is proven by the facts of Pagenstecher, Kilian, Schroeder, and others, even pelves with absolute contraction may yield to the pressure of the fœtal body, and allow birth at term. We might, therefore, here, wait for the induction of premature labor.

Uncontrollable Vomiting.—This is one of the most frequent indications after contracted pelvis, and all authorities are in agreement. The interruption of pregnancy is the only means of saving the mother, and on one condition, that we do not interfere too late.

From the statistics which Guéniot has collected, it is apparent that out of 118 cases 72 women recovered and 46 died. The 72 recoveries occurred:

Without miscarriage, all grave cases and subjected to varied treatment, 31. After spontaneous miscarriage, equally grave cases, 20. After induced miscarriage or labor, desperate cases, 21.

41 times, then, out of 72, cure resulted from premature labor, or miscarriage, artificial or spontaneous.

As for the deaths: Without miscarriage, 28. After miscarriage or spontaneous premature labors, 7. After induced miscarriage, 11.

McClintock reported to the Dublin Medical Society 36 observations of premature labor in case of uncontrollable vomiting, and of these 27 lived, and 9 died.

Cohnstein makes a distinction between multiparæ and nulliparæ, and does not counsel interference in the former: "after the expulsion of the fœtus, vomiting ceases in 40% of the cases. But we must distinguish between provoked and spontaneous miscarriage, since the former is 25% of the 40%, and the latter 15%. The remaining 60% includes the cases where vomiting only partially ceased, 26%; those where it persisted, 18%; those where it increased, 4%; and those where death occurred at once or shortly after miscarriage, 12%. He concludes that it is better to await spontaneous miscarriage."

We saw in the chapter on *uncontrollable vomiting*, that the selection of the time is of capital importance, and that it should be fixed at the end of the second period, without awaiting the third, the chances of recovery diminishing with waiting.

Finally, among the causes which justify miscarriage, we must cite retroversion of the uterus, hydramnios, molar pregnancies, and certain instances where the life of the woman is seriously endangered, pregnancy being complicated by cardiac or pulmonary lesions, or by intercurrent diseases.

Miscarriage once decided upon, it remains to choose the time and the method.

If it be disease which calls for the operation, the time is, of course, subordinated to the condition of the patient. We can fix no precise date. We must neither act too soon, nor yet too late. The same does not hold in case of pelvic deformity. Here the accoucheur, ordinarily, may choose his own time, but we must not forget that miscarriage is less grave at certain periods than at others. Although during the first two months, and generally from the fifth to the sixth month, miscarriage is simple and without complication, it is far otherwise from two and a half to four and a half months. It is usually, at this time, that we meet with serious hemorrhages, and miscarriage in two stages with retention of the secundines, and its sequelæ. It is of advantage, then, to practise the induction of miscarriage in the first two months, or after the fifth.

We are not, however, always free to choose, because, on the one hand, the patients are rarely seen before the third month, and because later we must take into account the degree of contraction, the volume of the fœtus, and the size of its head. De Soyre insists, particularly, on this point. The figures in the following table represent the mean dimensions of the fœtal head before term:

Months.	Weight in grains.	Length in Inches.	Occipito-frontal Diameter.	Bi-parietal Diameter.
Three Months	1,500	6.63	1.56	1.37
Three Months and a half.....	1,950	9.36	2.34	1.56
Four Months	2,280	7.22	1.85	1.76
Four Months and a quarter ..	4,500	8.58	1.95	1.95
Four Months and a half......	6,300	10.14	2.54	2.34
Five Months.................	8,325	11.89	2.73	2.34
Five Months and a quarter...	9,000	12.87	2.93	2.54
Five Months and a half	9,150	11.70	2.63	2.40
Six Months....	16,920	13.84	3.51	2.80
Six Months and a half	19,950	15.60	3.71	2.93

Up to this period, then, the fœtal head, on account of the flexibility of the bones, is much more reducible than at term, a reducibility which is increased by the width of the fontanelles and the sutures. It is, therefore, the degree of contraction which should guide us.

De Soyre divides pelves into two classes: 1. Those having at least 2.34, and not under 1.56 inches. 2. Those under 1.56 inches.

In the first, the pelvis being at least 1.56 and the fœtal head at 6½ months having a bi-parietal diameter of 2.93 inches, reducible by at least .78 of an inch, miscarriage should be induced between 4½ and 5½ months, that is, we wait as long as is possible.

In the second category, when the pelvis is 1.56 or less inches, the head admitting only .78 inches reduction, premature miscarriage should be induced all the more quickly, as the pelvis falls under 1.56 inches.

We may say then:

In pelves of 1.56 inches miscarriage need not be induced until 5 months; of 1.17 inches 4 to 4½ months; of .98 inches 3½ to 4 months.

Under .98 inches, if the patient is not seen till after the third mc and a half, the Cæsarean section is the only recourse.

As for the operative methods, they are identical with those descri in the previous chapter. Our preference, seeing that we take no acco of the fœtus, is for rupture of the membranes. The only precaution must take is not to wound the uterus.

CHAPTER VII.

THE CÆSAREAN SECTION.

UNDER the name, *Cæsarean section, sectio Cæsarea, partus Cæsareus, hystero-tomotoky,* we understand an operation which consists in opening the abdomen and the uterus of the gravida, in order to deliver thus artificially the fœtus, which cannot be born by the natural passages.

History and Statistics.—Pliny tells us that this operation owes its name to the fact that the first of the Cæsars was thus brought into the world, but according to others, its name is derived from the operation itself, *cæso matris utero.* It is practised not only on the living, but on women dead during pregnancy and labor.

Made lawful by the royal laws of Numa Pompilius, adopted by the Christian church, counselled by the Talmud and the Koran, it was practised for the first time in 1500, on the living woman, by Jacques Nufer, a swine herdsman, on his own wife, with success; but it was not till 1581 that the first treatise on the subject was written by Rousset. Opposed by Ambroise Paré, Guillemeau, Mauriceau, Viardel, Peu, Dionis, Amand; it was again successfully performed by Ruleau. Then appeared the monographs of Simon and of Levret. About the middle of the last century occurred the celebrated quarrel between the Symphysiotomists and the Cæsarianists, but, notwithstanding the intense advocacy of Saccombe and his anti-Cæsarean school, cases multiplied. Although all the successful cases were published, it was far otherwise with the others, and thus it is very difficult to give exact figures in regard to frequency and results; and it is only since the middle of the last century that we have been able to weigh the operation at all from the standpoint of its results for mother and for child.

Harris gives the data of 120 cases in the United States, and one fact is striking—the difference in the results obtained in the city and in the country:

In the country, . .	32 cases	Recoveries	20—62½%
In the towns, . .	55 "	"	19—34¼%
In the cities, . .	33 "	"	11—33½%

In 1866, Guéniot collected the following figures:

		Cases.	Recoveries.	Deaths.	Percentage.
Hull		231	139	92	39.82
Klein		116	90	26	22.44
Michaelis, (1801–30)		258	118	140	54.26
Kayser, (1750–1839)		338	128	210	62.00
Burns		24	2	22	91.66
Murphy	(British)	56	10	46	63.00
	(U. S.)	12	8	4	
	(Europe)	409	158	251	
Hubert	Baudelocque, (1750–1816)	73	31	42	57.55
	Michaelis, (1801–1832)	110	48	62	56.36
	Velpeau, (1700–1835)	265	118	147	55.47
	Sprengle, (18th century)	116	61	45	42.45
	Simonart	720	296	424	58.88
Pihan-Duffeuillay		88	50	38	43.18
Kayser		....	....	....	79
Hoebecke		16	11	5	31.24
Bosch		5	4	1	20
Stoltz		6	4	2	33.33
Winckel		15	7	8	53.33
Kilian		7	4	3	42.85
Bili		8	3	5	62.05
Bormey		2	1	1	50
Jolly		6	2	4	66.66
Simon		23	4	19	82.60
Guillemeau		5	....	5	100
Sentin		14	....	14	100
P. Dubois		17	....	17	100
Depaul		4	....	4	100
Danyau		3	....	3	100
Kunecke		6	....	6	100
Bouchacourt		5	1	4	80

Schroeder, in 1874, gives the following more recent statistics, compiled by Mayer:

	Cases.	Recoveries.	Deaths.	Percentage.
England	480	236	244	50
Germany	712	332	380	53
France	344	153	191	55
Belgium	11	4	7	63
Italy	46	5	41	87
America	29	8	21	33
	1,622	738	884	54

[From the latest publications of Harris on the Cæsarean section in the United States, we have collected the following data in regard to the operation from 1846 to the end of 1886:

Prior to 1846 there were 21 operations with 13 maternal recoveries and 10 children saved.

From 1846 to 1855, 25 operations: women saved 12, lost 13. Children delivered alive 13, dead 12.

From 1856 to 1865, 25 operations: women saved 12, lost 13. Children delivered alive 10, dead 15.

From 1866 to 1875, 36 operations: women saved 10, lost 26. Children delivered alive 11, dead, 25.

From 1876 to 1886, 37 operations: women saved 8, lost 29. Children delivered alive 16, dead 21.

Thus out of 144 operations, 55 mothers were saved and 60 children were delivered alive. In 42 of these cases, according to the same authority, uterine sutures were employed.

From a personal communication from Lungren, of Ohio, we gather that in this State alone there have been 13 operations with 9 maternal recoveries and 8 children born alive. Lungren has, himself, operated three times, twice on the same woman. These women recovered, and the one operated on twice is still living with her Cæsarean children.—Ed.].

The mortality, in general, from the Cæsarean section varies from 54% to 60%. It is not, therefore, astonishing to find accoucheurs admitting the justifiability of the Cæsarean section only exceptionally, and preferring, whenever at all possible, cephalotripsy or embryotomy.

[While this statement was true enough at the time of the author's writing, it is no longer so, since the improved Cæsarean section has been advocated and performed, in particular, by Sänger and Leopold. This improved Cæsarean section depends largely on the method of suturing employed for the uterine wound, and the greater success must also, in part, be laid to the score of earlier, more timely operation. In Germany this improved section is called after Sänger, who claims to have originated the method of suturing, which consists essentially in bringing the surfaces of the peritoneum in contact, in other words, the aim is at a seroso-serous apposition. While there can be no question that, owing to Sänger's writings, this method of suturing has become popularized, it is still true that he was by no means the first to use it, and it is further established, that the modified Cæsarean section, as performed to-day, is lacking in some of the details (excision of the muscularis, for instance) on which Sänger laid stress in his earlier writings. Careful study of the literature of this operation would lead us to reject giving to it the name of any special operator, although to Sänger, more than to any one else, belongs the credit of its special advocacy. Harris, of Philadelphia, writes us: "I am not in favor of calling operations after the names of men, as the title of an operation should be explanatory, if possible. The Cæsarean operation, with the seroso-serous multiple suturing of Sänger, would be proper." Garrigues, after an exhaustive and careful survey of the literature of the subject, claims that the improved Cæsarean section of to-day is the outcome of many improvements which have originated in time, and in the hands of different operators. These improvements he classifies as follows: The antiseptic treatment; early operation; turning out the uterus before incision; the insertion of a few sutures at the upper end of the incision in the abdominal wall, so as to tie them promptly when the uterus is turned out, thus preventing protrusion of intestines and entrance of blood into the peritoneal cavity; the pushing of a piece of disinfected gutta-percha tissue behind the turned-out uterus, in order further to protect the peritoneal cavity; the compression of the cervix by means of a rubber tube, in order to avoid or arrest hemorrhage from the uterus; the avoiding of shock by wrapping the uterus in warm cloths; the method of uterine suture.

As for this suture, the essential part of which is the bringing of the peritoneal surfaces into contact, it has long been recognized as of great advantage. In the United States Lungren, of Ohio, used it in his two operations on the same woman (1875, 1880); Baker, of Indiana, in 1880, put "four carbolized silk sutures in the uterus, not through the entire thickness of the walls, but passed in near the mucous surface and out a short distance from the incision through the peritoneal coat, so that when they were tied they brought the peritoneal coats together first." Spencer Wells, in 1881, in speaking of the removal by laparotomy of tumors from the uterine wall, clearly proved the advantage, not alone of a seroso-serous suture, but of deep muscular sutures as well; Garrigues, himself, in 1882, used this double method of suturing. In 1882 Sänger's first contribution to the subject appeared, in which he advocated the removal of a piece of the muscularis from both edges of the uterine wound, resection of the peritoneum, but there is no special reference to turning in of the peritoneal surfaces, and their suture in this position. Leopold shortly put these recommendations into practice, but has since, with Sänger, Credé, and others, dispensed with exsection of the muscularis.

From this sketch of the details which go to form the modified Cæsarean section, we believe it apparent that to no single operator should belong the honor of having it called after him. Sänger is unquestionably entitled to much of the credit, and it is through his writings that certain details have become popularized, but to call the operation after him is to give no credit to the gentlemen who individually contributed to its present success by the introduction of certain details and the rejection of others. We much prefer, therefore, to call the operation the modified Cæsarean section, which is a non-committal and yet sufficiently distinctive term.

For the latest statistics we are again indebted to Robert P. Harris:

Up to 1886 there have been performed 38 operations, which may be classified as follows:

Countries.	Cases.	Maternal Recoveries.	Maternal Deaths.	Children Saved.	Children Lost.	Percentage of Maternal Recoveries.
Germany........	25	21	4	24	1	84
United States...	5	0	5	2	3	0
Austria	4	2	2	1	0	50
Italy	2	1	1	4	3	50
France.........	2	2	0	2	0	100

The percentage of women saved in all countries is $68\frac{8}{19}$; and that of women saved in Europe is 78.

Since the above figures of Harris there have been no cases recorded. Lusk, within a few weeks, has operated on a case successfully as regards both the mother and the child. In this country, as Harris justly puts it, we have yet to learn to make the operation one of choice and not of compulsion.

The record of individual operators from the improved Cæsarean section is of special interest. Credé, in his analysis of 26 cases, notes the following points:

Recovery of the mother, ...	76.0%
Death, " "	24.0%
Children born alive, ...	88.4%
" " dead, ...	11.6%

In three of the fatal maternal cases, septic infection existed before labor; twice, in very grave cases, infection occurred during the operation; in two cases the patients died of other grave complications.

Of 23 cases with 4 deaths, operated upon in Germany and in Austria, not a single death is referable to the operation itself, or to the method employed.

Of Leopold's ten cases, one of which was operated upon by Korn:

Nine recoveries (maternal)	90%
One death "	10%
Children delivered alive,	100%

Of 6 cases operated upon at Leipsic, 4 by Sänger, and one each by Obermann and Donat, there was not a single maternal death, and all the children were saved.

From these groups, then, we obtain a total of 16 cases with 15 maternal recoveries (93.7%), and all the children living.

The great point which stands out clearly from these cases is the necessity of timely operation.—Ed.]

Levret and Simon first formulated the indications for the Cæsarean section, and it is thanks to their efforts that the operation was made justifiable. They found ready followers in Smellie, Stein, Baudelocque, Stoltz, etc. These indications may, according to Naegelé and Grenser, be divided into absolute and relative.

Absolute.—When the pelvic contraction is so pronounced that the fœtus can be delivered, neither living nor dead, by the genital passages.

Relative.—When the pelvis is so contracted that the fœtus cannot be delivered at term without mutilation; that is, when we have to choose between cephalotripsy, embryotomy, and the Cæsarean section.

Authorities, however, are not in accord in regard to the limits to be assigned to contractions of the pelvis. Thus: Baudelocque places the limit at 2.6 inches. The cephalotribe invented by his nephew lowers this limit, and P. Dubois, who accepts 2.6 inches when the fœtus is living, labor begun, membranes intact or recently ruptured, places the limits of cephalotripsy at 2 inches when the fœtus is dead.

Jacquemier	descends	to	2	inches, fœtus living.
Cazeaux	"	"	1.95	"
Tarnier	"	"	"	"

Depaul descends to 1.56 inches, although he prefers the Cæsarean section in pelves of 2.34 to 1.56 inches when the fœtus is alive.

Stoltz invariably rejects embryotomy when the fœtus is alive, as well as induced miscarriage; and far from lowering the limits of the Cæsarean section, he tends to raise them. Guéniot places the limit at 1.56 inches;

Joulin at 1.56 inches; Michaelis at 1.83 inches; Scanzoni performed Cæsarean section from 2.65 to 3.12 inches. Naegelé and Grenser consider 2.51 inches as the extreme limit for embryotomy. They cite, however, four cases of Michaelis at 1.83 inches, and Osborne's extraordinary case, where the diminished fœtus was extracted through a pelvis of .8 of an inch. Schroeder states no limit, but admits as an indication extensive cancer of the soft parts. Spiegelberg admits that we should resort to the Cæsarean section down to 2 inches, but, in case the pelvis is obliquely contracted, embryotomy is practicable down to 1.5 inches. Barnes, who admits the absolute and relative indications, performs, nevertheless, embryotomy in pelves of 1.4, 1.2, and even .98 inches. Playfair resorts to the Cæsarean section below 1.4 inches; Hyernaux below 1.85 inches. Hubert de Louvain, on the other hand, resorts to the Cæsarean section if the infant is alive in pelves of 2.73.

In view of the danger from cephalotripsy, and the disastrous results under 1.56 inches, we believe we should accept this as the figure under which the Cæsarean section is called for; nevertheless, the results obtained by Pajot through his method of repeated cephalotripsy without traction are so satisfactory, that down to 1.17 inches it is allowable to choose between the two operations. In reality, however, for the majority of accoucheurs, the indication for the Cæsarean section is absolute under 1.5 inches.

As for the relative indication, it depends entirely on the judgment and feeling of the individual accoucheur. Although the majority prefer to sacrifice the living infant in the hope of increasing the maternal chances, a certain number, in France and abroad, do not believe that they have the right to kill the fœtus, and prefer to perform the Cæsarean section even in pelves of 2.73 inches. Their reasons are the following:

1. Embryotomy performed in such a pelvis is as dangerous for the mother as the Cæsarean section.

2. Embryotomy always kills the fœtus, while the Cæsarean section, performed at the proper time, should always save the fœtus.

3. We have no right to kill the fœtus when we may save it, and, at the same time, not seriously compromise the life of the mother.

These objections, we believe, are not really tenable:

1. We have seen that the mean mortality rate from the Cæsarean section may be placed at 54%. If, now, we look at the figures from cephalotripsy, we find that in 67 cases of pelvic deformity, from 2.53 to 1.4 inches, there

were 39 recoveries and 28 deaths, a mortality of 41.79% (Maygrier's thesis, 1880); and among these cases there were 31 where the pelves measured 2.34 inches at the highest, with 17 recoveries and 14 deaths, a mortality of only 45.16%. The Belgian statistics are still more favorable: In 79 cases of contraction to 2.73 inches and below, where the saw-forceps was used, there were 86 recoveries and only 10 deaths, that is to say a mortality of 10.41%:

56 cases, 2.73 to 2.34 inches contraction, 52 recoveries; 4 deaths, mortality of 7.14%; 40 cases, below 2.34 inches, 34 recoveries, 6 deaths, mortality 15%.

Hubert, the younger, perforates, and in 18 cases, 2.93 to 1.56 inches contraction, had 16 recoveries, 2 deaths, mortality of 11.11%.

The results, hence, are certainly more favorable when the fœtus is sacrificed.

Pajot, with cephalotripsy repeated without traction, in 8 cases, in pelves from 2.34 inches to 1 inch, had 6 recoveries.

2. The Cæsarean section, the objectors say, should always give a living infant. Practically this is not true; for it results from Kayser's figures that the infantile mortality is 30%, and in this figure are not included those which die in the first days after birth.

3. The third objection, we think, is also of no value. We do not believe we have the right to hesitate between the precarious life of an infant and that of an adult woman who, likely enough, may bear other children. What should ever guide the accoucheur is the interest of the mother, even though this entails the sacrifice of the child; and even as we maintained the right of the accoucheur to induce miscarriage, even so do we claim that he has not the right to wilfully expose the woman to the dangers of the Cæsarean section. As Cazeaux justly says, "that which is certain in the Cæsarean section, is that we sacrifice at once at least one half the women; and, further, what the experience of centuries proves, supposing all the infants to be extracted alive, not one half will reach the age attained by their mothers."

For us, the section should be an operation of absolute necessity, and we do not admit the relative indications; and as long as the instrument, cephalotribe, saw-forceps, perforator, etc., can pass, it is to it that we give the preference. Repeated cephalotripsy, without traction, is a marked progress, since it has enabled Pajot to save 6 women out of 8, where the pelves were contracted from 2.34 inches down to 1 inch. As to whether the Porro operation is as great a progress, we will see presently.

[As we will note later on, laparo-elytrotomy, as revived by Thomas of New York, would seem to offer the best chances to both the mother and the child, when performed at the time of election.—Ed.]

Although Rousset included among the indications for the Cæsarean section, excessive size of the fœtus and mal-presentations, tumors and congenital vices in development of the genital canal, etc., Simon and Levret reduced these indications to cases of pelvic contraction and certain large tumors of the cervix, to which Baudelocque added schirrous, broad-based tumors, which were not operable except at greater risk than the section offered. To-day, these indications, we have seen, are reduced nearly to pelvic deformity; for cases of fibrous tumors, seeming to call for the Cæsarean section, have been reported where labor has terminated spontaneously, even with living children, proving how great are the resources of Nature, and to what extent we ought to count on her coming to our aid. The same is true of carcinoma of the cervix, although here we might well hesitate, seeing that the mother is already condemned, as it were, to death from the fact of the disease alone. We still, however, believe that here, as well, the Cæsarean section should be postponed to the utmost limit. As regards osteo-malacia, in certain cases a natural termination of labor is possible, and therefore we should act with the greatest reserve.

As for the contra-indications, they depend on the state of the mother and on that of the fœtus. If the fœtus is dead, if the mother is exhausted by long labor or by repeated attempts at delivery, anything, we believe, is preferable to the Cæsarean section, for we would simply diminish her chances by an operation which might not save the fœtus. Three conditions, hence, we think, are absolutely indispensable, in order to justify the operation: 1. The necessity must be absolute, that is to say, there is no other method of terminating labor. 2. The child must be living and viable. 3. The mother must formally consent to the operation. None of the risks should be hidden from her. As Naegelé and Grenser remark, "the intellectual state of the mother may render her incapable of judgment. In this case it belongs neither to the husband, nor to the family, nor to the physician, to decide in favor of the Cæsarean section. We must then resort to every other method less dangerous to the woman, except when the section really affords her better chances."

Once having determined on the operation, what is the time of election? All authorities are in agreement here. It is just before, or just after, rupture of the membranes—that is to say, when dilatation has proceeded to a degree, and the uterine contractions are intense and regular. Graefe is the only one who counsels waiting later.

Without being possibly of very great importance, the length of the labor is an element in prognosis: Kayser, in 164 cases where the duration of labor was noted, found:

	Mothers.		Infants.	
	Recovered.	Died.	Recovered.	Died.
After 24 hours duration, .	20	40	42	16
“ 24 to 72 hours “ .	34	41	48	24
Over 72 “ “ .	8	21	11	17
	62	102	101	57

He thinks, then, that only after 72 hours does duration have a bad effect.

Harris, however, proves that after 24 hours the influence is bad:

Before 24 hours, . .	7 operations	7 recoveries
“ 34 “ . .	7 “	4 “
After 34 “ . .	10 “	1 recovery.

Of 100 cases collected by Radford:

Before 24 hours, . .	24 operations	7 recoveries
After “ “ . .	76 “	9 “

Harris, in 17 personal cases, and where the operation was undertaken at the end of the first day of labor:

In 7 cases before 34 hours, . . .	4 recoveries
“ 10 “ after “	1 recovery

In 16 cases where peritonitis occurred after operation, 13 times the operation was performed 30 hours after the beginning of labor.

Radford, in 100 cases:

24 before 24 hours, ...	7 recoveries
76 “ “ “	9 “

and he places the mortality at 70 to 88%.

A curious fact is that the operation seems to lose gravity when practised for the second time on the same woman. Lungren, in this connection, gives the following figures:

Of 48 women subjected altogether to 119 sections, 8 died, and 40 recovered.

OPERATION.

Preliminary Precautions.—These are absolutely the same as for ovariotomy: An isolated room, temperature of 80° to 90° F., filled with carbolic spray. All instruments and sponges (new) should be soaked in a carbolized solution, having previously been for twenty-four hours in alcohol. Operate on a table. Four assistants, at least, are needed: one to anæsthetize, another to hold the uterus through the abdominal walls, one to hand the instruments and to watch the spray, one, a nurse, to receive the infant. The necessary instruments, etc., are: a convex and a blunt-pointed bistouri, a director, ligatures, artery forceps, tenacula, scissors, silver wire, needles, and six to eight lengths of diachylon plaster to go around the body once and a half, cotton, napkins, etc. The rectum and bladder should be emptied.

The lateral incisions of Levret, the transverse of Lauverjat, the oblique or diagonal of Stein, the younger, Osiander's method, are to-day abandoned in favor of Deleurye's method, incision in the linea alba. (Fig. 130.)

The uterus must be brought to the mid-line, and held there by an assistant, and by percussion we must assure ourselves that there is no intestine between the organ and our line of incision.

Gastro-elytrotomy.—This is an operation which consists in opening into the vagina, through an incision made in the abdomen, so as to avoid the peritoneum. It was proposed by Joerg, modified by Ritgen and the younger Baudelocque, and then was forgotten till in the last few years it was resuscitated by Thomas, Skene, Edis, Garrigues. Notwithstanding the favorable results obtained in America, the operation has not been accepted in France, where the classic Cæsarean section is in high favor.

[Notwithstanding the fact that laparo-elytrotomy, as modernized by Thomas, of New York, has not been received with favor in France or Germany, or, with two exceptions, in England, this essentially American operation should have the preference over all others, where the operator can elect the time, seeing that, uniformly, under such conditions it has given the best results both for mother and child.

The preliminary precautions, as regards cleanliness and the preparation of the woman, are similar to what should hold for any major abdominal operation. The incision should be made on the right side, about 1 inch above Poupart's ligament, and extending from an inch above the anterior superior iliac spine to within about 1½ inches of the spine of the pubes. The muscles and the fascia are to be divided carefully on a director down to the peritoneum, always remembering the danger of wounding the peritoneum. When this has been exposed, it is to be separated from the fascia iliaca and pushed above. The lateral vaginal wall is thus reached. At this point the ureter is to be carefully sought for, isolated, and lifted out of the way. The vaginal wall should be pushed upward into the wound by a sound in the vagina, and then nicked with the scissors, or burnt through with the Paquelin cautery, when it is to be *torn* as far as is necessary by the fingers. The cervix is then to be brought into the

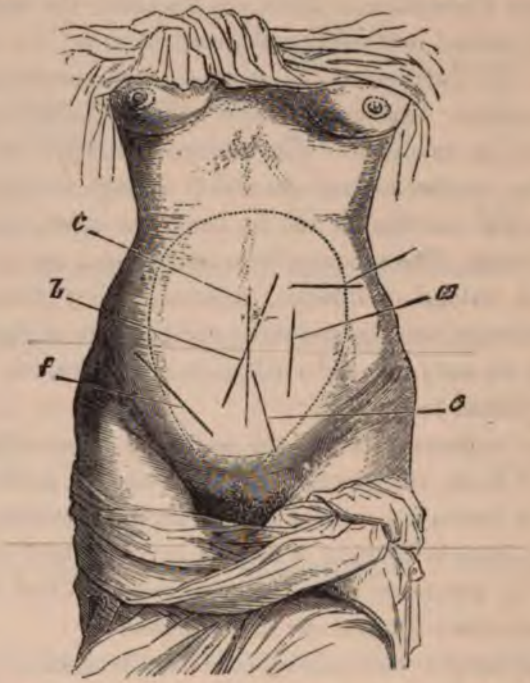


FIG. 130.—DIFFERENT INCISIONS.—*a*, Levret's. *b*, Stein's. *c*, In linea alba. *d*, Lauverjat's. *e*, Osiander's. *f*, Ritgen's.

wound, and the child extracted, manually, or by the forceps, carefully watching lest the ureter be injured.

Such is the operation of laparo- or gastro-elytrotomy. It is extra-peritoneal; the uterus is not wounded; the peritoneum should not be; the ureter and bladder are the only organs likely to be injured. To determine this, it is advisable to inject warm water or milk into the bladder, before suturing the incision. The after-treatment is similar to that after any abdominal incision.

The time of election, and indeed the necessary precautions for its full success, are: By preference, head above the brim, or just engaged, membranes unruptured or just ruptured, cervix dilated or dilatable, and lastly, timely resort to operation, before exhaustion has at all set in. *This is the key-note to success.*

By the operation of laparo-elytrotomy, shock and danger of septicæmia are far less than in the classic Cæsarean section; secondary hemorrhage is hardly a factor, and yet, even after the improved Cæsarean section, there is still danger of internal hemorrhage from tearing of the sutures or relaxation of the uterus. In case the bladder is torn or cut, sew it up at once.

The operation has now, January, 1877, been performed 12 times, so far as they have been recorded, with six maternal deaths and five infantile:

		Mother.	Infant.
1. T. G. Thomas, U.S.,	7th m'th,	Died.	Lived one hour.
2. Skene, "	At term, (C.V. 2½ in.)	Died in 7 hrs.	Dead.
3. Skene, "	" (C.V. 2¾ in.)	Recovered.	Recovered.
4. Skene, "	" (C.V. 1⅕ in.)	Recovered.	Lived 18 days.
5. Thomas, "	" (C.V. 2¾ in.)	Recovered.	Saved.
6. Hime, England,	"	Died in 2 hrs.	Saved.
7. Edis, "	" (2½ in.)	Died in 40 hrs.	Saved.
8. Gillete, U.S.,	" (1½ in.)	Recovered.	Putrid.
9. Dandridge, U.S.	" (2¾ in.)	Died in 40 hrs.	Dead.
10. Jewett, "	"	Died in 72 hrs.	Dead before delivery
11. Skene, "	" (less than 2 in.)	Recovered.	Saved.
12. Jewett, "	" (4½ in.)	Recovered.	Saved.

Of these twelve operations, all the mothers that were lost were in an exhausted condition, and, in a number, previous attempts at delivery, forceps, version, craniotomy, had been made. The operation, then, in these cases, was not done in time, and judging from the cases which recovered, had laparo-elytrotomy been resorted to at once, instead of precious time having been lost, all might have recovered. It is further to be noted, that of the six successful cases, three were done in hospital. As for the child, in three instances it was dead before operation, in one it died during extraction.

From these data, we believe the assertion justifiable that laparo-elytrotomy, resorted to early, offers the best chance of all operations which aim at saving the child, as well as the mother. It is questionable, indeed, if, in the near future, it is not destined to supersede, where the child is alive and the time is opportune, not only the Cæsarean section (classic and modified), and Porro's operation, but also to relegate to their proper sphere, where the child is dead, in particular, the mutilating methods, craniotomy, cephalotripsy, embryotomy.—Ed.]

In the performance of the classic Cæsarean section, we may distinguish four stages: 1. Opening the abdominal cavity. 2. Opening the uterus and extraction of the fœtus. 3. Removal of the placenta, arrest of hemorrhage, toilette of the peritoneal cavity. 4. Suture of the abdominal wound, and dressing.

Incision into the Abdominal Cavity.—The operator stands on the right of the patient, and with the convex bistouri makes an incision five and a half inches long, down to one inch above the pubes. The incision should be in the linea alba. It is carefully prolonged to the peritoneum, cutting layer by layer on the director. Each bleeding vessel should be ligated, or seized with forceps, and then the peritoneum should be opened to the same extent as the incision in the parietes.

Opening of the Uterus, and Extraction of the Fœtus.—The assistant opposite the operator should compress the uterus at the level of the incision, and keep the omentum and intestines from issuing. The uterus is to be incised, layer by layer, but rapidly to prevent loss of much blood, and by preference the incision into the uterus should be prolonged upwards. If the membranes are intact, we must keep them so as long as possible. The incision into the cavity is to be made with a blunt-pointed bistouri along the guiding finger, in order not to injure the fœtus. As soon as the membranes have been ruptured, the fœtus is to be grasped by the portion which presents, and it is slowly extracted, so as not to wound the uterine walls. The cord is tied, cut, and the fœtus given to the nurse. (Fig. 131.)

Whenever possible, it is advisable to grasp the infant by the head, since, as the uterus is emptied, the uterine wound contracts, and, therefore, when we extract by the feet, we may find some difficulty in removing the larger head. During the entire period of extraction, the assistant must carefully press the abdominal parietes against the uterus, to prevent entrance of blood into the abdominal cavity.

Extraction of the Placenta.—The placenta and the membranes are carefully peeled off and removed entire. All clots are then removed, and uterine contractions are excited by friction, by massage, by the hypodermatic injection of Yvon's ergotine. The complications which may be met with are: 1. The placenta may lie under the line of incision. 2. The uterine wound may contract around, and delay the head. 3. Hemorrhage. 4. Adhesions of the placenta. 5. Prolapse of the intestines through the abdominal wound. 6. Escape of liquor amnii, or of blood, into the peritoneal cavity.

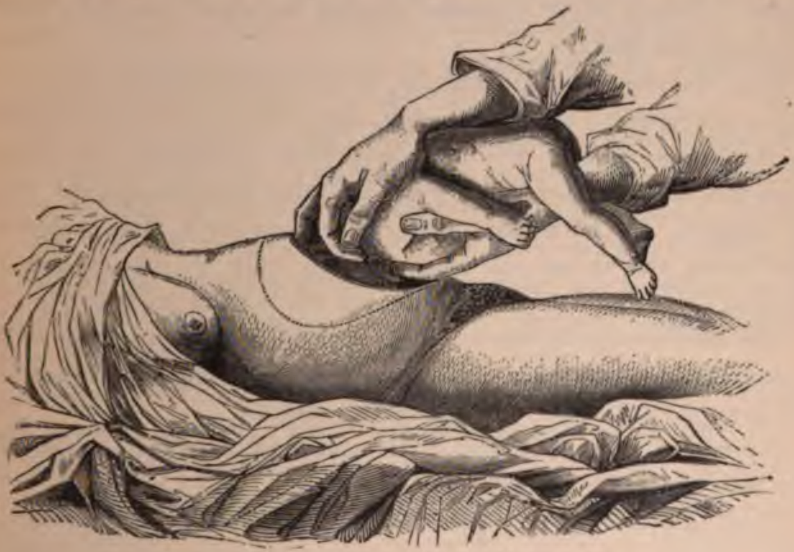


FIG. 131.—CÆSAREAN SECTION. EXTRACTION OF THE FŒTUS.

It is at times possible to recognize the placental site through the uterine walls, and then our incision should be made outside of it. When we meet the placenta the operation must be finished as quickly as possible, the placenta removed first, and the fœtus extracted afterwards. This complication is one of the most serious.

The head may be grasped by the uterine or abdominal edges, and, in the first instance, the gravity is great, for the uterus cannot contract, and the blood wells out of the open uterine sinuses. The incision must at once be enlarged sufficiently to allow extraction of the head.

It is ordinarily after extraction of the fœtus that hemorrhage is profuse, especially if contractions are not energetic. This is the gravest of all the complications. The uterus must be made to contract. We must use friction, cold water, ice, alcohol applications; if these do not suffice, Ritgen advises bringing the uterus outside the incision in the abdominal wall, and not returning it to the peritoneal cavity till all hemorrhage has ceased. Indeed, Ritgen advocates bringing the uterus externally before extracting the fœtus.

When the placenta is adherent, its removal is difficult, but should be attempted carefully, although quickly, and in the aim of leaving nothing in the uterine cavity. We reject the advice of Wigand, Joerg, Stein, Planchon, and Maygrier, to terminate the third stage through the natural passages. We never know, till we seek to remove it, that the placenta is adherent, and we can the more certainly break up the adhesions by working through the wound than through the vagina and the cervix.

The intestines and omentum usually protrude at the upper angle of the abdominal incision. This may be avoided by causing the assistant to compress the abdominal walls against the uterus.

Before closing the abdominal incision, we must, even as in ovariotomy, carefully cleanse the peritoneal cavity.

When all hemorrhage has been checked, and the uterus well-contracted, and the peritoneal cavity thoroughly cleansed, we must unite the abdominal wound. If necessary, we must wait an hour or two before doing this. And now the question arises, must we suture the uterus, or leave this to Nature?

[Before stating Charpentier's deductions in regard to this point, we would recapitulate the essential modifications in the operative technique, which have been introduced of late years.

1. Before incising the uterus, turn it out, compress the abdominal incision below it, place an antiseptic dressing, gauze, sublimated or carbolized towel, gutta-percha, under the organ. The object is to prevent exit of intestines, and to prevent entrance of extraneous matters into the peritoneal cavity.

2. Pass a rubber cord around the uterus, at the supra-vaginal junction,

and twist it in order to limit hemorrhage from the uterus when it is incised.

3. After the emptying of the uterus and the disinfection of its cavity, deep suture of the muscularis, and sero-serous suture of the peritoneum.—Ed.]

The uterine suture was first used by Lebas, was rejected by Levret, Smellie, Baudelocque, Gardien, Velpeau, Jacquemier, and is to-day admitted in certain cases by Stoltz, Schroeder, Naegelé and Grenser, and has been used by Harris, Wiesel, Godefroy, Malgaigne, Tarnier, Spenser Wells, Grandeso Silvestri, Martin, father and son, Veit, Birnbaum, Routh, Tauffer, Breisky, Oswald, Laroyenne, Barnes, Spiegelberg, etc. The results obtained by these gentlemen are very contradictory; yet the uterine suture would seem rather harmful than useful.

[In the light of the experiences of the past few years, this statement is the reverse of the fact. For the reasons we gave when speaking of the improved Cæsarean section, it is apparent that the uterine suture, properly applied, is one of the greatest of all the advances made in the technique of the Cæsarean section in modern times, and that to it is largely due the excellent results which are being obtained in Europe by Sänger, Leopold, etc.—Ed.]

Dusart and Tarnier have gone further still, and, not content with suturing the uterus, they unite it as well to the abdominal incision, the *viscero-parietal* suture. In a case where we saw Tarnier use it, the patient died. In this case the lower angle of the uterine wound was left open, and in communication with that of the abdominal wound, and through these openings Tarnier passed a long piece of cloth, which was carried through the cervix into the vagina. The patient died on the third day.

Stoltz thus describes his procedure: "He rejects on principle the uterine suture, for the incision into the uterus, when the organ has thoroughly contracted, is so narrow that there is no necessity of bringing the edges together. Where, however, the incision has necessarily been very extensive, or the organ does not contract well, then the suture might be of utility. Separate sutures of metallic wire might be of great value. As for the abdominal incision, its union is absolutely necessary, but authorities differ in regard to the manner. Many consider a simple bandage, of linen, or of plaster, sufficient; others are in favor of the suture. Lauverjat condemned the suture; Deleurye considered it useless; but Baudelocque praised it. Most of the advocates of the suture prefer the running, others the separate. Successes by either method are about equal. Over these, however, long slips of plaster, encircling the body, should be placed. Latterly metallic sutures have replaced those of catgut and silk. There are two sets, the one deep and the other superficial. For the deep, silver or platinum wire is preferable. The first suture should be inserted at the upper angle, and the rest about 1½ inches apart. They should be inserted about 1½ inches from the margins of the wound, and include the peritoneum. Each suture end is twisted around a quill. Care should be taken not to include intestine or omentum in the line of suture. (Fig. 132.) Superficial sutures of silk are placed between each deep suture to prevent gaping, and to keep the borders in exact apposition. Then plaster strips are passed around the body to make compression and to keep the edges in contact."

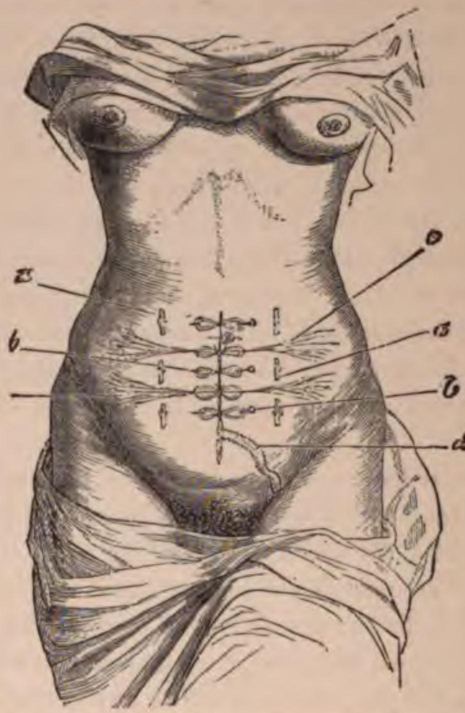


FIG. 132.—SUTURE OF THE ABDOMINAL WALL.—*a*, Deep quill suture. *b*, Twisted superficial suture. Cotton around each suture. *d*, Cotton or linen drain at inferior angle.

Stoltz, Reich, Hilmann and Barnes are opposed to the drain at the inferior angle, as also, strongly, to the method of Cazeaux, and of Tarnier, of passing the drain through the cervix into the vagina. Barnes says that the capital point is to close the wound.

The dressing of the incision is similar to that after ovariotomy.

AFTER-TREATMENT.

Stoltz divides this into surgical and medical.

Surgical Treatment.—Contrary to Barnes, who favors the entire closure of the wound, Stoltz believes in leaving the lower angle open to allow the escape of whatever liquid may collect in the peritoneal cavity. The first dressing should not be changed till the third or the fourth day, except in case of symptoms of hernia, of intestinal strangulation, of purulent collection. If union occurs by first intention, the superficial sutures are removed on the fourth day, the deep on the fifth or sixth day. The lower angle should be left open as long as there is drainage.

Medical Treatment.—The first complications are hiccough, vomiting, tympanites. Stoltz recommends cold applications, antispasmodics, the ether douche, opium, injections of morphia, and of the sulphate of quinine. Metz (Berlin, 1852), who had 7 recoveries in 8 operations, gives the following directions: "As soon as the patient has been put in her bed, cold applications are to be placed on the abdomen, and ice given by the mouth, these measures to be kept up as long as the patient feels well." (Naegelé and Grenser.)

For peritonitis Stoltz recommends leeches, frequently applied, and the sulphate of quinine; Naegelé and Grenser, oil purgatives.

The lochia should be carefully watched and good drainage kept up. Convalescence is ordinarily slow, and recovery is rarely assured before the sixth week. During this period, the diet should be carefully attended to, as any error may be fatal. The patient should wear an abdominal binder for months afterwards.

[The after-treatment should in all respects be similar to that of any abdominal operation. Where the uterine and abdominal sutures are used, and the peritoneal toilette has been carefully attended to, we question the advisability of using the drainage tube. We are further opposed to the use of opium in any form, except when absolutely demanded by pain, during convalescence, for the reason that it paralyzes the peristalsis of the intestines, and locks up the secretions at a time when all the emuncteric organs should be kept active, to carry off the products of retrograde metamorphosis. In case of tympanites, large enemata of turpentine, one drachm to the pint, are often of great service, administered by preference through a long rectal tube. These failing, we should not hesitate to puncture the intestines through the abdominal wall. A weak faradic current over the intestines, by awakening peristalsis, may assist in the expulsion of flatus.

In case of symptoms of peritonitis, following the example set by Lawson Tait, we believe it advisable to give a full saline purgative, before bringing the patient well under the influence of opium. When the inflammatory trouble is marked and the temperature is at or above 102° F., the ice-coil should be placed on the abdomen and maintained for days, if necessary, taking the precaution to insert between it and the abdomen a napkin or fold of cotton, to prevent refrigeration of the skin. For the temperature, antipyrin, given preferably by rectal suppository, in thirty grain doses repeated every four hours till the temperature falls to 101°, should be our mainstay, never forgetting, however, when administering this drug, its depressing effect on the heart, and protecting it, therefore, by alcohol, digitalis, according to indication. Such are additional means of after-treatment, which, if faithfully followed, may save even a forlorn hope.—Ed.]

PROGNOSIS.

The statistical data which we gave at the outset, make clear the gravity of the operation, and show why certain authorities absolutely reject the Cæsarean section, except in case of stringent necessity. But, curiously enough, the repetition of the operation on the same woman does not entail unfavorable results; it seems, even, as though the mortality were less, for, in 17 cases collected by Kayser, the mortality was only 29%, and Lungren, who has collected 119 operations practised on 49 women, found only 8 deaths, or 6.73%.

The large majority die in the three first days. After the first week, according to Michaelis, only one in nine. Michaelis and Oetler have each operated four times on each of their patients. Barnes explains these results by the fact that the uterus in healing contracts parietal adhesions, and, therefore, in case of a second hysterotomy, the incision lies in these adhesions, the peritoneal cavity being shut off, and this is why he advocates the viscero-parietal suture. Such cases, however, seem rather to indicate individual tolerance than to give statistical proof of the innocuousness of the operation. Frerichs has reported a case where he performed the section for pelvic deformity, and the mother and the child recovered. The same woman again conceived, and premature labor was induced at about eight months. The uterus ruptured: gastrotomy was resorted to, to deliver the child. The intestines escaped from the incision, and to replace them it was necessary to make repeated punctures, notwithstanding which, they had to be incised to allow of escape of fæcal matter. The woman recovered perfectly, and Barnes asks, how many women are thus tolerant?

As for the children, all those who are in good condition at the beginning of the operation should be born alive, provided it be performed before, or a little after rupture of the membranes, and the child be extracted rapidly. The longer we wait before operating after the onset of labor, and especially after the escape of the liquor amnii, the greater risk for the infant. Kayser places the infantile mortality at 39%. Scanzoni, who investigated the lot of 81 children delivered by 120 Cæsarean sections between 1841 and 1853, found that 53 lived, or 60%. During the past few years Porro has proposed such a radical modification of the section, that it calls for special study, although, as we will see, its results have not been as good as was expected, and that, therefore, modern authors tend to return to the classic section, and to improve its methods. Thus Halbertsma, believing that the greatest risk is from hemorrhage through wound of the placental site, endeavors to avoid this by making a preliminary puncture to determine the placental site, and then carrying his incision outside of this region. Contrary to the practice of Müller, who pulls the uterus out of the abdominal cavity, throws an elastic ligature, or Esmarch's bandage, around the cervix, and then cuts into the uterus, Halbertsma makes his incision, with the uterus *in situ*, on the anterior surface. Hence he cannot well avoid the placenta, seeing that, in the majority of instances, it is inserted on the anterior uterine wall, and his exploratory punctures are useless.

Cohnstein advocates drainage of the uterine wound. He pulls the uterus to the surface, and makes his incision on the posterior surface, in order to drain Douglas's *cul-de-sac* as well, and he rejects the uterine suture. Müller objects to this method, and says that drainage under these conditions is very difficult, and has little chance of success.

Frank similarly rejects the uterine suture, and he seeks to close the abdominal incision, as hermetically as possible, through the ancient utero-abdominal suture (the viscero-parietal of Dusart), which he has essentially modified. His suture is very complicated, and aims to closely unite the anterior surface of the uterus to the abdominal wall, and also to make a large connection between the uterine cavity and the exterior. His method, however, is generally rejected.

Sänger rejects the viscero-parietal suture, returns to the uterine, but makes a double suture. Uniting, at the outset, the muscular tissue, he then brings together the peritoneal edges which have been peeled off the uterus. He seems however, as Müller remarks, not to be very confident in his method, for he recommends, in addition, massage and faradization of the sutured uterus as a safeguard against hemorrhage. Finally, he believes in drainage of the peritoneal cavity.

Finally, Kehrer has added another modification. He believes the success of the operation depends on the following three conditions: 1. Strict Listerism; drainage of the peritoneal cavity; drainage and irrigation of the genital canal. 2. Double uterine suture (after Sänger). 3. Transverse incision on the anterior surface, at the level of the internal os. This latter incision, according to Müller, will determine anteflexion of the uterus, and thus oppose gaping of the edges of the incision, which occurs so frequently from perversion of contractions, and uterine inertia.

We believe that the modifications should be in the direction of antisepsis. The results obtained by surgeons in ovariotomy through antisepsis, would seem to point out the way for the obstetricians, although we do not forget that ovariotomy and the Cæsarean section are not comparable. In the one instance we remove a diseased organ from out of the body; in the other, we open and extract a fœtus from an organ in a state of full physiological evolution. However vascular the pedicle of an ovarian cyst, it can never compare to the proportions of the gravid uterus. There is also a further phenomenon, which, it seems to us, has received too little attention; we refer to uterine involution, the puerperal state, a fact which, we think, aside from the immediate complications of the operation, plays the important *rôle*, and in which resides the real danger threatening the life of the patients, and rendering the section so grave, and, unhappily, so disastrous.

CHAPTER VIII.

PORRO'S OPERATION.

THE unfavorable results from the Cæsarean section necessarily led to modifications of the operation, and according to Müller, of Berne, Cavallini, in 1769, removed the gravid uterus from animals, and seeing them survive, deemed a similar operation possible in case of woman. Geser, in 1862, Fogliata, in 1874, Rein, in 1876, performed operations similar to those of Cavallini, and reached the same conclusion. Michaelis, and the younger Stein, were also advocates of the operation, whilst Kilian, in 1850, and other operators, were opposed to it.

In 1868, Storer, of Boston, performed the first utero-ovarian amputation in woman. He was doing gastrotromy for the removal of a fibroid tumor from a gravida. At the outset of the operation, the hemorrhage being considerable, he determined on opening the uterus, and extracting the fœtus. The hemorrhage still persisting, he pulled the uterus and its annexa outside of the abdominal cavity, threw a ligature around the cervix at the supra-vaginal junction, and amputated the uterus, the ovaries, and the tubes. Three days thereafter the woman died, and this was for a time fatal to the method. Storer's operation, however, was a matter of necessity, and it is really Porro, who, in face of the difficulties and complications of the classic Cæsarean section, concluded in favor of the utero-ovarian amputation under the carbolic spray, and performed it the twenty-first of May, 1876. The mother and child were saved, and this too at the maternity in Pavia, where, at the time, puerperal septicæmia was raging. This success encouraged others, and the operation was performed in Italy, Germany, Austria, Russia, etc. In France, Fochier, of Lyons, first performed it in 1879, he was followed by Lucas-Championnière and by Tarnier, and since, especially in Italy, this operation tends towards displacing the classic section. Thus:

Imbert de la Touche, . .	in 1878	mentions	6 cases
Castro-Soffia, ...	“ 1879	“	32 “
Pinard, ...	“ 1880	“	38 “
Harris (Philadelphia), . .	“ 1880	“	50 “
Levis (Copenhagen), . .	“ “	“	51 “
Maygrier, ...	“ “	“	51 “
Zweifel, ...	“ 1881	“	74 “
H. Simpson, ...	“ “	“	76 “
Petit, ...	“ 1882	“	78 “
Charpentier, ...	“ “	“	99 “

In the 99 cases which we have collected are included cases of cancer, of tubo-ovarian pregnancy, of uterine rupture, etc., for in all of these the operation was the utero-ovarian amputation, or that of Porro. We have left out cases of Freünd's operation, because they do not belong in this category.

These 99 cases occurred in the following countries:

Italy, . . .	38	England, ...	4
Austria, . . .	21	Russia, ...	2
Germany, . .	11	Switzerland, . .	1
France, . . .	10	Holland	1
America, . .	5	Sweden, ...	1
Belgium, . .	4	Turkey, ...	1

The following were the results: Mothers living 43; dead 56. Infants living 70; dead 26. In the infantile deaths are included four where the result has not been stated.

The mortality figures differ a little from that obtained by other authors:

	Mortality.		Mortality.
Pinard, 1880, .	45.4 %	Zweifel, 1881, .	59.4 %
Petit, 1882, .	55.10%	Championnière, 1882,	67. %
Maygrier, 1880, .	58.49%	Charpentier, 1882,	56.56%
Simpson, 1881 .	58.3 %		

To the above cases must be added 5 additional, where both the mother and child were saved, performed since 1880.

The total percentage of recoveries and deaths, therefore, is:

Maternal mortality, 56 out of 105, 53.33 per cent.; recovery, 40 in 105, 46.66 per cent. Fœtal mortality, 25 out of 105, 23.80 per cent.; recovery 76 in 105, 76.20 per cent.

As for the indications in these 99 operations:

Rickets,	54 cases	Osteosarcoma,	1 case.
Osteomalacia,	12 "	Infantile pelvis,	1 "
Fibromata,	5 "	Kyphosis,	1 "
Uterus septus,	4 "	Generally cont. pelvis,	1 "
Uterine rupture,	3 "	Dyspnœa,	1 "
Cancer,	2 "	Not noted	14 cases.

Comparing now the mortality rate from Porro's operation with that from the Cæsarean section we obtain:

Porro's operation 53.33 per cent. to 56.56 per cent. Cæsarean operation 54 per cent. to 60 per cent.

We see, hence, that the results obtained from Porro's operation are scarcely better than those from the Cæsarean section. We are not now speaking of the children, since, in theory, they should always be saved by either.

Among the causes of death, peritonitis heads the list with 22 cases; shock 3 cases; septicæmia 2 cases; hemorrhage 3 cases; embolism 1 case. In a certain number of cases, the condition of the women was such that only death could be expected.

If now we compare the results from Porro's operation, and from others:

		Mortality.
Induced premature labor,	Pinard,	32.35%
Cæsarean section,	Mayer,	54. %
"	Harris,	70 to 88%
"	Zweifel,	54 to 60%
Porro operation,	Pinard,	45.4 %
"	Petit,	55.10%
"	Charpentier,	56.56 or 53.53%
"	Simpson,	58.2 %
"	Zweifel,	59.4 %
"	Maygrier,	58.49%
"	L. Championnière,	67. %
Cephalotripsy and embryotomy,	Maygrier,	41.79%
" "	Charpentier,	28.68%

It is not possible to form an exact opinion from these figures, for if all the cases of Porro's operation have been published, such is not the case with the Cæsarean section, and the other operations. What is clearly evident, however, is that, like the Cæsarean section, Porro's operation should be, not one of choice, but of absolute necessity, and that the chances of success are the greater if done within twenty-four hours of th onset of contractions.

Pinard thus lays down the indications for the Porro operation:

1. The pelvis does not allow of embryotomy. Here the indication i absolute, and we agree perfectly with our colleague. Preference shoul be given to the Porro over the Cæsarean section.
2. The pelvis allows embryotomy, but measures less than 2.7 inche If the fœtus is dead, then perform embryotomy, except in case of osteomalacia. If the infant is alive, the proper operation is a subject for discussion. We would not agree with Pinard, but would say that, the fœtu alive or dead, embryotomy should be the choice.
3. The pelvis measures over 2.7 inches. Porro's operation should be absolutely rejected.
4. Finally, with Alessandrini, of Milan, Pinard advocates the Porro operation in case of rupture of the uterus. The cases cited by Halbertsma, and the results given by Jolly in his thesis, seem to justify this opinion.

As for the indication from the presence of fibrous and cancerous tumors, we have discussed it elsewhere.

To resume, then: Porro's operation, like the Cæsarean, should be one of absolute necessity, and whenever we have the choice between it and another, it is to the other that the preference should be given.

[The results obtained of late years through the improved Cæsarean section, have led most authorities to practically reject the Porro operation, except in case of rupture of the uterus, which makes the Porro an operation of necessity, where it is not possible to use the uterine suture.

We are again indebted to the labors of Dr. Robert P. Harris for the more recent statistics of this operation, and its modifications, which we append below.

	Maternal Mortality.	Maternal Recoveries.	Children Saved.	Children Still-born.	Children Dying during Extraction.
Pure Porro, 90 Cases....	49	41	71	17	3
Porro-Müller, 36 Cases....	17	19	28	7	2
Porro-Veit, 13 Cases....	10	3	10	3	0

In many of the cases in this table the maternal death was due to the fact that the operation was deferred too long, and since the compilation of the table the total number of operations has been increased to 164. "Deducting from this number 3 moribund cases, and 14 in which the stump was dropped and proved fatal in 10, we have remaining 147 cases with 44 per cent. maternal recoveries." (Harris.)

In regard to the various methods in vogue for the delivery of the child *per abdominem*, Harris sums up the question so tersely and justly, that we append his remarks: "The Cæsarean section and the Porro are largely dependent for success upon the condition of the patient at the time it is performed. If then a timely, elective, and pre-arranged Cæsarean operation must have an unfavorable prognosis because of the physical condition and poverty of the subject, can much more be anticipated from the Porro improvement under the same disadvantages? Laparo-elytrotomy may prove less fatal than either, because it neither wounds the uterus nor opens the peritoneal cavity."

To sum up this question in the light of to-day's knowledge, we would say: Perform laparo-elytrotomy if the conditions essential to its performance are present; if not, perform the modified Cæsarean section with deep muscular and sero-serous superficial sutures; reject the Porro or its modifications except in the presence of rupture of the uterus where the uterine suture cannot be used; above all, operate in time, before exhaustion has set in, and pay strict attention to scrupulous cleanliness.—Ed.]

DESCRIPTION OF THE OPERATION.

Preliminary Precautions.—These are identical with those applicable to ovariotomy or the Cæsarean section.

The operation is divided into four stages:

1. Incision of the abdominal wall.
2. Incision of the uterus, and extraction of the fœtus.
3. Amputation of the uterus and ovaries, and formation of the pedicle.
4. Dressing of the abdomen.

Incision of the Abdomen.—The incision should extend from 1½ to two inches above the pubes to one to two inches above the umbilicus, to one side of which it passes. The peritoneum is divided on a director.

Incision of the Uterus and Extraction of the Fœtus.—The uterus is brought close to the abdominal wall, and is incised layer by layer. The membranes are ruptured, and the fœtus extracted.

Müller brings the uterus externally, and applies an elastic ligature around the cervix at the level of the internal os, and then only does he open the uterus and extract the fœtus. This is the method which Rein followed in his experiments on animals.

Instead of the ligature, Litzmann and Fehling use Esmarch's bandage. Resorted to by Litzmann, Breisky, G. Braün, Tarnier, Tibone, C. Braün, Chiara, and others, Müller's modification has given good result only in the hands of Breisky. It can be only used in easy cases, for it may result in tears or injury of the peritoneum, and hence in peritonitis.

Amputation of the Uterus and Ovaries, Formation of the Pedicle.—Porro incises the uterus in position, and it is only after extraction of the fœtus that he draws it out by means of long ovarian forceps. He then passes a trocar through the uterus, at the junction of the body and the cervix, and through this two metallic wires, which are twisted the one to the right and the other to the left. He then amputates.

Tarnier and Championnière pass a steel needle through the uterus at the same junction, and a second, at a slightly higher level, perpendicularly to the first. A wire loop is passed around the cervix, underneath these needles and including the ovaries and tubes, and this is twisted, and the uterus is amputated about ½ inch above the wire. The peritoneal cavity is then cleansed, and the pedicle is fixed in the lower angle of the incision in the abdominal wall. The abdominal incision is united by metallic sutures. The dressing is the same as after ovariotomy.

Schlemmer (Stuttgart, 1881) objects to the Porro operation, on the ground that it is immoral, since it removes all possibility of further conception, and therefore might be abused.

Müller, whose thesis is simply an eloquent plea in favor of the Porro operation, is compelled to admit the bad results of this operation, and that they are not much more satisfactory than those from the classic section. He ends his conclusions in the following words: "The day when a large number of cases prove to me that, by means of modifications of the classic section, we have obtained as sure a guarantee against hemorrhage and sepsis as is offered by the utero-ovarian amputation, then I will be the first to declare against the Porro operation. Until then I will remain a partisan in its favor, seeing that I have personally tested its advantages."

Notwithstanding these words of Müller, the tendency to-day is to return to the classic section, and the search is always in the direction of improving the technique of this operation.

CHAPTER IX.

THE POST-MORTEM CÆSAREAN SECTION.

AT first sight it would seem as though there could be no doubt as to the necessity of practising this operation, whenever, after the twenty-eighth week of pregnancy, the mother dies, and the living child cannot be extracted by the natural passages, or only after delay which would compromise its life. There are, however, two circumstances which modify this law, so natural and obligatory, leaving out of question the religious point of view. 1. We possess, at present, no absolute timely sign on which we may rely as pointing to the maternal death, and as Naegelé and Grenser put it, "aside from the cases where death results from prolonged disease, typhoid, phthisis, etc., where we are in no doubt as to the cessation of life, it will never perhaps be possible to obtain certainty of death at a time when the section should be made in order to save the fœtus." There are further a number of cases recorded where the operation has been performed on women in a state of apparent death, such as those of Peu, Trinchinetti, Reinhardt, Bodin, d'Outrepont, etc.

2. We do not know exactly the time which may elapse after the mother expires before the fœtus dies.

The results of the operation are not very satisfactory. According to Heymann and Lange, in 331 operations, only 6 to 7 children were saved, and 13 lived but a few hours; according to Schwartz, in 107 operations, performed in the electorate of Hesse, not one child was saved.

Breslau, on the other hand, who has made experiments on animals, deduces the following conclusions:

1. There can be no doubt but that the fœtus, human as well as animal, survives the mother when death has been sudden, as in hemorrhage, asphyxia, apoplexy, etc.

2. The human fœtus survives the sudden maternal death longer than the animal fœtus.

3. The section is not likely to save the child if performed beyond fif-

teen to twenty minutes after the maternal death. The best known cases are those of Pingler, the infant extracted alive, fifteen minutes after the maternal death, and lived 32 minutes; infant extracted 23 minutes after, and survived; Breslau, extraction 15 minutes after, and lived a few hours; Brotheston, 23 minutes, infant lived; Hoscheck, a few minutes, infant lived; Campbell, 10 minutes, infant lived 14 years.

4. If the mother dies of an essential fever, we cannot hope to save the infant, because its life-supplies have not been cut off suddenly, but little by little. The same holds true of poisoning by substances which determine rapid decomposition of the blood, such as prussic acid. Death from chloroform seems to be an exception, because it does not seem to penetrate into the circulation of the infant.

Breslau adds, "the duty of every physician is always, as soon as the mother's death is established, to resort to the Cæsarean section, unless, indeed, the fœtus be dead before the mother, or where we can extract it more readily by the natural passages." (Naegelé and Grenser.)

[There is a natural repugnance in the mind of every one towards allowing the mother's body to act as the infant's coffin. Even, therefore, where the death of the fœtus antedates that of the mother, it is more appropriate to extract the fœtus by section, except, of course, where this is possible *per vias naturales.*--Ed.]

Extraction by the natural passages has been advocated by Naegelé and Grenser, and by Thévenot, and we pass briefly to the study of the question.

CHAPTER X.

ARTIFICIAL DELIVERY THROUGH THE NATURAL PASSAGES AS A SUBSTITUTE FOR THE POST-MORTEM CÆSAREAN SECTION.

WE may have to face two very different conditions, which we will examine in succession. The choice of operative method will depend upon which of these conditions is present.

1. *Labor has begun; the Cervix is dilated or dilatable.*—Although delivery by the natural passages, as a substitute for the *post-mortem* Cæsarean section, was advocated for the first time by Schenck, in 1665, it was Rigaudeaux who first resorted to it, in 1745, in a woman who was believed to be dead, but was only in a state of apparent death. Delivery by version was successful, and thereafter, Baudelocque, 1796, Capuron 1811, Gardien, 1824, Velpeau, 1835, pronounced themselves in favor of it. In 1832 Heymann, and in 1833 Rizzoli, even went so far as to advise the *accouchement forcé* in case the cervix was not dilated or dilatable, but in France and in Germany, Siebold, Naegelé, Velpeau, Chailly, Cazeaux, opposed this and pronounced in favor of the Cæsarean section. Duparcque, Devilliers and Otterburg, nevertheless, agreed with Rizzoli, and in 1861, Depaul counselled delivery by the natural passages, no matter what the condition of the cervix. One thing, however, is indispensable, and this is a normal pelvis, since success will depend on the ease and rapidity of the operation. For lack of attention to this prerequisite, Beluzzi, in 1863, after vainly attempting delivery by the natural passages, resorted to the Cæsarean section too late to save the child.

The pelvis being normal, either, 1, the head presents and is deeply engaged, or, 2, it presents but is movable above the superior strait, or, 3, another portion of the fœtus presents.

In the first instance we should, of course, deliver at once by the forceps. Reinhard reports five cases, one successful (Jackson), and Devilliers one case, child dead—that is 6 cases, with 5 dead infants. Under the second condition there are no cases on record; under the third, version is indicated, and Thévenot cites 5 observations: Verhöff, 1819, child saved; Talinucci, 1854, child dead; Bataille, 1861, child lived seven hours; Franchini, 1861, child saved; Guéniot, 1863, child dead. In all these instances delivery was easy, except in Guéniot's, where the extraction of the aftercoming head required incision of the cervix and the forceps. Success, it is apparent, will depend on the little time which elapses between the death of the mother and resort to operation; for although Villeneuve cites cases where living children were obtained by the Cæsarean section from two and a half to four hours after maternal death, these cases are not authentic, and fifteen minutes must be stated as the extreme limit at which it is possible to obtain a living child.

2 *Labor has not begun, or has just begun.*—In this case, Duparcque, Heymann and Rizzoli, also counsel delivery *per vias naturales*, and state that the procedure is not of much greater risk to the infant than under the previous condition. Thévenot reports a number of instances, cases of Rizzoli, Golinelli, Capari, Beluzzi, Hyernaux, Rivani, Talinucci, etc., and in five of the cases the mothers were only in a state of apparent death, the children being delivered alive. It is on account of the fact that we cannot always be sure of the mother's death that Thévenot, and we agree with him, counsels delivery *per vias naturales* in preference to the Cæsarean section. Ordinarily the hand suffices for dilatation, although, where necessary, the cervix may be incised, and delivery accomplished by the forceps or by version.

In 1827, Costat claimed that it was incumbent on the accoucheur to terminate labor in every instance where pregnancy was complicated by a disease threatening the mother's life, whenever the fœtus was viable. Of the instances where this advice was followed we cite: Duparcque, 1840, consumptive woman *in extremis;* Guiseppe, 1844, in a case of apoplectic coma; Esterle, 1861, reports 4 cases, infants all living; Beluzzi, 1877, 3 cases. Thévenot collects, altogether, 15 instances of *accouchement forcé, in extremis,* with 13 living children, 6 surviving, and 5 mothers saved, 3 relieved. These cases are certainly encouraging, although we cannot quite share Thévenot's opinion: "Delivery should be resorted to in the interest of the mother as well as of the child, and furthermore the *accouchement forcé, in extremis,* is without danger." It is the opinion of all obstetricians that *accouchement forcé* in the living woman is a disastrous operation, and should only be resorted to as an *ultimum refugium,* and yet it is advocated on a dying woman, where the least shock may be the last drop which causes the goblet to overflow! The logic is false, and, as one of the observations proves, it is rather for the spiritual than for the temporal interest of the child that the practice has been advocated, to baptize, in other words, the infant. The fact is that no one is in a position to say positively that the woman is dying, and therefore we would reject absolutely *accouchement forcé* under these conditions, and we would formulate our practice as follows:

1. Labor has commenced, cervix is dilated or dilatable; rapid extraction by forceps, or by version.

2. Labor has not begun.

a. The woman is dead, or in a state of apparent death; delivery *per vias naturales,* by incision of cervix, if necessary, and forceps or version.

b. The woman is *in extremis:* Respect her condition, and do not hasten her end by manœuvres which may possibly not save the child. Once the mother dead, however, act quickly in the interests of the child.

CHAPTER XI.

SYMPHYSEOTOMY.

THIS operation was proposed by Sigault, in 1768, and after having been the cause of considerable discussion, has to-day almost fallen into neglect, except in Italy. Morisani, of Naples, read a paper on the subject before the London International Medical Congress, 1881. To quote from this paper: Symphyseotomy has been practised fifty times at Naples, twice on the same woman, with the following results: 40 women saved, 10 dead, 20 per cent; 41 infants saved, 9 dead, 18 per cent.

Kilian, in 68 cases, found a maternal mortality of 32 per cent., and a fœtal of 63 per cent.

In 45 instances the vertex presented with 4 deaths; in 3 the pelvic extremity, with 3 deaths; in 2 the trunk, with 2 deaths. In 50 cases the conjugate measured:

In 12, 3.3 inches; in 16, 2.9 inches; in 7, 2.7 inches; in 13, 2.6 inches; in 2, 2.4 inches.

Where the measurement was over 3 inches expectation was the rule, and even the forceps was used before resorting to symphyseotomy. The lowest limit of the operation is placed at 2.6 inches. Unfavorable results are often obtained because this lowest limit is disregarded.

Comparing the statistics of embryotomy in Italy by Tibone and Chiara, and those from the Porro operation, Morisani makes the following statements:

Embryotomy, Tibone, .	Mat. mort.	21%
" Chiara, .	" "	24%
Symphyseotomy, Morisani,	" "	50% (41 living infants.)

Porro operation, 13 out of 27 mothers, and 24 out of 27 infants saved.

[By reference to the results obtained from the modified Cæsarean section, in particular, it is at once apparent that symphyseotomy has nothing in its favor. Of the last 18 operations, Harris points out that 8 mothers were lost, and 5 children.—Ed.]

Morisani uses a blunt-pointed curved bistoury, with the cutting edge on its concave surface. "We make an incision about 2 inches above the symphysis down to the articulation. The bistoury cuts through the interosseous cartilage from below upwards. We then wait for spontaneous delivery, unless the pains are feeble, or the head does not engage, in which event we extract with the forceps."

Whatever the results obtained by Morisani, we do not believe that many obstetricians are prepared to return to symphyseotomy.

CHAPTER XII.

EMBRYOTOMY: PERFORATION.—CRANIOTOMY.—CEPHALOTRIPSY.—CRANIOCLASTY.—EVISCERATION.

BROADLY, embryotomy is an operation by which the volume of the fœtus is diminished in order to render delivery easier, or even possible. It is known under the various names which head this chapter. It has been practised from the earliest times where the infant is dead, but to-day it is still rejected by certain accoucheurs, notably Stoltz, where the infant is alive. Stoltz, however, is about the only one who absolutely rejects the operation where the infant is living, for the most pronounced advocates of the Cæsarean section resort to embryotomy where the mother refuses the section. For our part, we believe that the accoucheur should never forget that the life of the child is not at all comparable to that of the mother, and that, therefore, he ought never to hesitate to sacrifice the former in order to increase the chances of the latter. We must never forget, furthermore, that embryotomy will give the most favorable results the earlier it is resorted to, and the less the previous efforts to obtain a living child. Once then we are satisfied that Nature cannot accomplish her task, and we have tried by reasonable means to save the life of both child and mother, we are of the opinion that we should absolutely neglect the child and turn our whole attention to saving the mother.

The statistical results vary considerably according to the country and operator. Sickel gives us the following figures in regard to frequency of employment of various operations:

Perforation	Sickel	in	470,975	labors,	400	times.
	Oldham	"	22,681	"	81	"
	Johnston and Sinclair	"	13,933	"	130	"
	In Germany	"	434,371	"	189	"
Cephalotripsy		"	12,273	"	21	"
Embryotomy		"	304,150	"	22	"
Cæsarean section		"	422,686	"	97	"
Premature labor		"	465,908	"	48	"

In a table constructed by Ploss, giving the statistics of perforation and cephalotripsy in the German maternities, there are 540 out of 291,618 labors.

Pawlick, recapitulating the cases reported of decapitation by Braün's hook, gives a mortality of 24 per cent.; Spaeth gives the recoveries as 77 per cent.; Müller in 17 perforations had only 2 deaths; in 26 premature labors 3 deaths of the mother, and 12 of the children.

At the *Clinique*, Paris, from 1852 to 1880 (the year 1853 lacking): Cephalotripsy, 202 cases.—Mothers living 145; mothers dead 57. Embryotomy, 56 cases.—Mothers living 39; mothers dead 17. Maternal mortality 28.68 per cent.

The statistics of Rigaud and of Stanesco give a mortality of 38.52 per cent. in 122 cephalotripsies.

Once having determined on embryotomy the choice of the method remains. In one operation the head of the fœtus is alone involved, at other times the trunk. We will consider these methods under the following headings:

1. Perforation of the skull.
2. Cephalotripsy.
3. Cranioclasty.
4. Sawing of the head.
5. Sape sphenoidienne of Guéniot, intra-cranial cephalotripsy of Guyon, transforation of Hubert.
6. Decapitation, decollation, detruncation.
7. Evisceration, brachiotomy, spondylotomy.

I. PERFORATION.

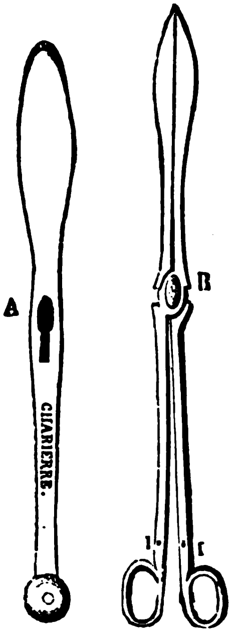
This is the most ancient of all methods for reducing the size of the head, and it consists in the artificial opening of the vault of the skull, in order to give exit to the brain, in addition, exceptionally, to the removal of pieces of the bone. Innumerable instruments have been devised for the purpose. Sadler and Levy have given a succinct description of all. We will note here simply the most important.

a. *Cutting Perforators.*—Those devised by Hippocrates, Albucasis, Paré, Guillemeau, Mauriceau, Roederer, Stark, Wigand, Waller, and others. These are to-day practically all rejected.

b. *Scissor Perforators.*—Those of Bing, Wallbaum, Smellie (Figs. 133 and 134.) Naegelé (Fig. 135), Levret, Stein, Denman, Brunninghausen, Siebold, Busch, Simpson, Oldham, Greenhalg, Blot (Figs. 137 and 138), etc. The last is decidedly the best, particularly since it is absolutely harmless to the mother and the accoucheur.

c. *Trephine Perforators.*—Those of Joerg, Mende, Ritgen, Kilian, Leissnig (Fig. 136), Braün, Martin, etc.

As we have said, the best instrument is Blot's. It is composed of tw blades. When closed the dull edge of each covers the sharp edge of its fellow. By pressure at D the blades open like Smellie's scissors.



Figs. 133 and 134.—Smellie's Scissors. (Modified.)

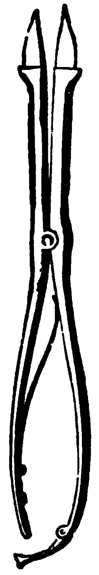


Fig. 135.—Naegele's Scissors.

The indications for resort to perforation, are:

1. *The Fœtus is dead.*—Perforation is indicated whenever the disproportion between the head and the pelvis renders spontaneous delivery difficult, in particular where, if the forceps is used, damage to the maternal parts might result.

2. *The Fœtus is living.*—Whenever the capacity of the pelvis justifies, the forceps should first be tried, always, however, taking care not to damage the mother. If, after three to four attempts, the forceps does not

bring down the head, we believe it disadvantageous to the mother, and of no advantage to the child, to persist longer. We should perforate, and then resort to craniotomy or not according to the case.

One of the great advantages of perforation is that it may be resorted to before complete dilatation of the cervix. The cervix need only be dilated

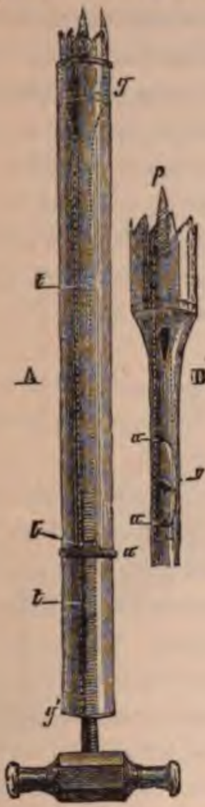


FIG. 136.

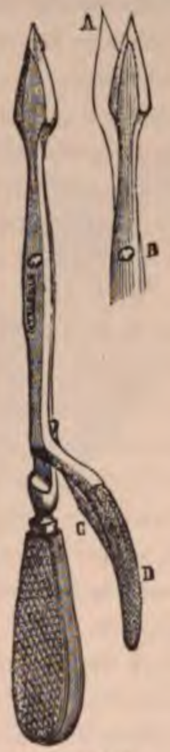


FIG. 137 and 138.

FIG. 136.—LEISSNIG'S TREPHINE PERFORATOR, MODIFIED BY KIWISCH.—*g*, Upper portion, and, *g'*, er portion of the canula. *b*, Steel screw holding the two portions together. *t*, Blade. *B*, Crown the trephine. *P*, Point of trephine. *v*, Screw blade which works in *aa*.

FIGS. 137 and 138.—BLOT'S PERFORATOR, CLOSED AND OPEN.—*A*, Separated blades. *B*, Lock. *C*, ring which keeps the blades closed. *D*, Handle, pressure on which opens the blades.

fficiently to allow of the passage of the instrument. Under the influ- ce of the contractions of the uterus, the skull empties itself of its con- nts, the bones collapse, and we have frequently seen labor terminate ontaneously where instrumental extraction would have been called for d the head remained intact. Usually, however, perforation is in- fficient, and cephalotripsy must follow it.

In Holland and in Belgium, the perforated head is extracted by means of the lever. Tarnier prefers the forceps, particularly where the contraction is not great. We resort, in such instances, to Bailly's cephalotribe, which we will shortly describe.

We have stated that before perforating a few attempts should be made to deliver by the forceps. If this fails, it is advantageous to still hold the head in the forceps blades, and perforate between them, for thus we may fix the head by directing an assistant to make gentle traction on the handles; and further, by compressing the handles we assist in the expression of the cerebral matter and in causing the bones to collapse. Often thus we may complete extraction with the forceps, and thus do away with the necessity of inserting the blades of the cephalotribe. We cannot insist too strongly on perforating before using the cephalotribe, else we may deliver the mutilated fœtus and to our horror see it live for some minutes.

Operative Method.—We must consider this successively where the before-coming head, or the face, or the after-coming head, presents. We always use Blot's perforator.

1. *Presentations of the Vertex.*—The preliminary precautions and the position are the same as in any obstetrical operation. Since the operation itself is not painful, chloroform is only requisite when, in addition to perforation, immediate extraction or cephalotripsy is requisite, and then narcosis should be induced to the surgical degree. The rectum and bladder should always be first emptied. An assistant should steady the head firmly through the abdominal walls at the superior strait. The operator introduces the index and middle finger of the left hand into the vagina, and inserts them into the cervical canal against the head. The perforator is then guided by these fingers, and its point applied perpendicularly against the fœtal head. It is not essential to perforate through a suture or fontanelle, but the point of the instrument is pushed boldly down to the bone, and then the instrument is rotated from right to left, and from left to right, in order to facilitate the passage through the bone. As soon as the instrument has penetrated the cranial cavity, by pressure on the handle the blades are opened, and the instrument is moved in every direction in order to thoroughly break up the brain. Pressure on the handle is then relaxed, the blades close, and the instrument is withdrawn. In these manœuvres the maternal parts are exposed to absolutely no risk.

On the withdrawal of the instrument blood and cerebral matter generally issue from the vulva. (Fig. 139.)

2. *Presentation of the Face.*—Perforation, in this instance, is a trifle more difficult. The instrument may be made to penetrate either through the orbit, the frontal bone, or the palatine arch, the last offering the greatest difficulties. We prefer the frontal bone, although we do not agree with Naegelé and Grenser in believing it indispensable to perforate through the frontal suture.

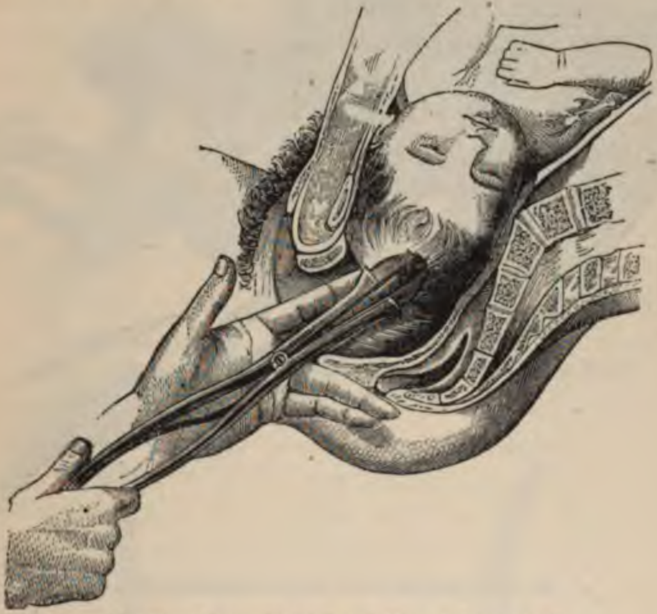


FIG. 139.—CRANIOTOMY WITH THE SCISSOR PERFORATOR.

3. *The after-coming Head.*—Here manipulation is still more difficult, since the body of the child is in the way and the occipital bone is so thick.

We must, therefore, perforate either under the chin, or else, as is preferable, through one of the posterior lateral fontanelles. (Fig. 140.) Chailly prefers perforating through the palatine vault for the reason that he believes the point of the instrument is less likely to slip. He recommends the insertion of two fingers into the mouth, forcible depression of the inferior maxilla, and penetration with Smellie's scissors through the palate into the skull.

Perforation alone rarely suffices. Cephalotripsy must ordinarily be superadded. For extraction of the head, blunt and sharp hooks have been recommended (Figs. 141 and 142), but we absolutely condemn them on account of the risks which they entail. Bone forceps have also been devised (Fig. 143), and the simplest of all is that of Danavia, described by Baudelocque, and recommended by Pajot. This instrument, however, is often not effective, owing to the yielding of the bones, and either the forceps or the cephalotribe is better.

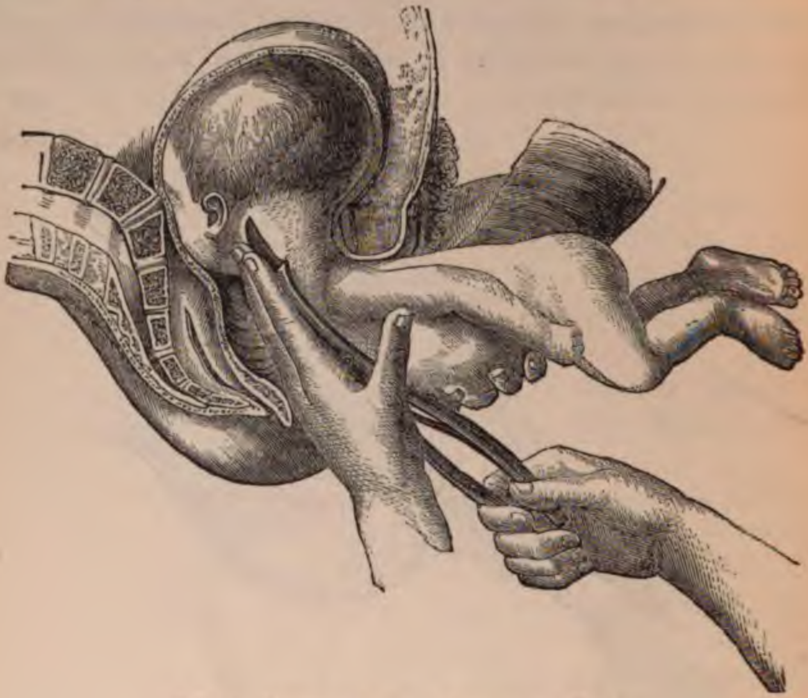


FIG. 140.—PERFORATION OF THE AFTER-COMING HEAD.

II. CEPHALOTRIPSY.

This is an operation which consists in crushing the head of the fœtus, in order to diminish both its volume and its resistance. The operation was in reality first placed on a scientific basis by Baudelocque, the nephew, in 1829. It was not, however, till 1834, that he gave to the instrument its present shape.

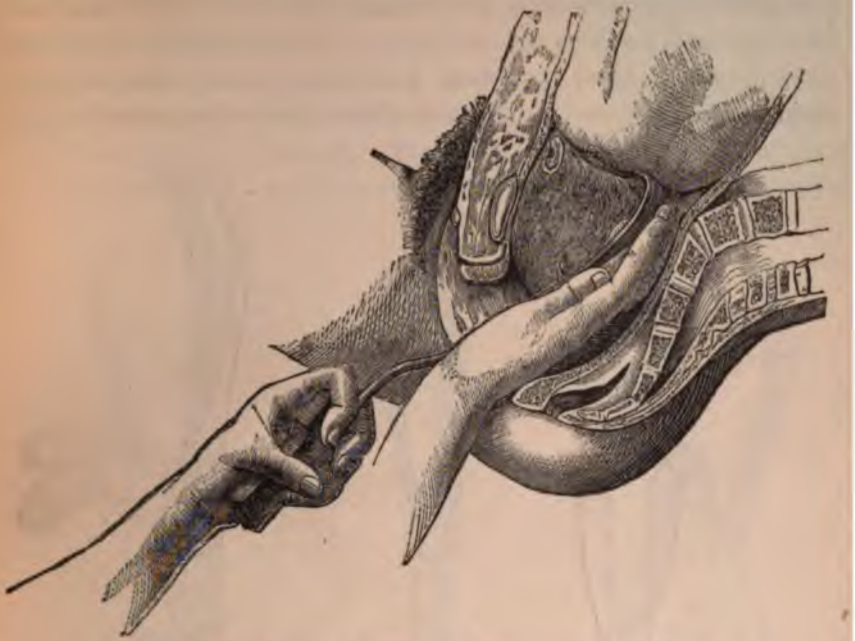


Fig. 141.—Extraction of the Head by means of the Blunt Hook.

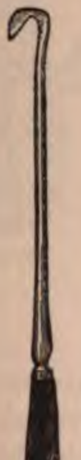


Fig. 142.—Sharp Hook.

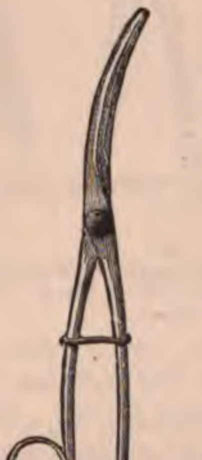


Fig. 143.—Bone Forceps.

Baudelocque's cephalotribe (Fig. 144) is composed of two strong blades 21 inches long, weighing about 4⅗ pounds, with no fenestræ. The maximum breadth is about 1½ inches. The lock is similar to that of Brunninghausen's forceps. The distance between the blades is about 1 inch and these are slightly convex externally, and concave within. The pelvic curve is about 4 inches. The blades are approximated by a screw rod.

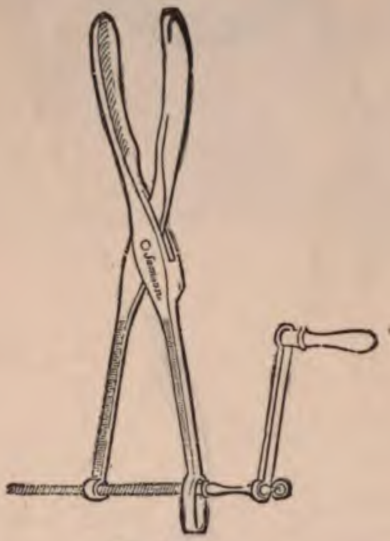


FIG. 144.

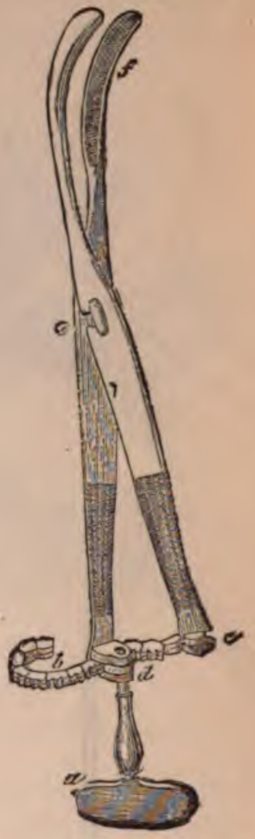


FIG. 145.

FIG. 144.—BAUDELOCQUE'S CEPHALOTRIBE.

FIG. 145.—DEPAUL'S CEPHALOTRIBE. *a*, Screw working the chain *b*, *c*. *d*, Groove for passage of chain. *e*, Lock. *f*, Blades.

Since the time of Baudelocque the cephalotribe has been modified as extensively as the forceps. (For a detailed description of each form, see Lauth's thesis, 1863.) The best known instruments are those of Busch, Cazeaux, Ritgen, Langenreith, Martin, Dubois, Kilian, Depaul (Fig. 145), Kiwisch, Chailly (Fig. 146), Scanzoni (Fig. 147 and 148), Braün, Breisky, Bailly, Tarnier, Blot.

We will describe simply the three last.

Blot's cephalotribe (Fig. 149) is composed of two blades; like the forceps, each blade is fenestrated. The blades are a trifle more curved than is the case in Baudelocque's instrument. They are convex on one surface and concave on the other. Their extremities touch. The instrument is constructed of steel, and the handles are roughened for firm grasp. The left blade holds the pivot on which the compressing bar articulates; the right blade is bifurcated at its extremity to allow of the passage of the same bar. The lock is Brunninghausen's. The blades having been applied, even as with the forceps, the compressor bar is articulated and passed through the bifurcated extremity of the right blade, and then, to

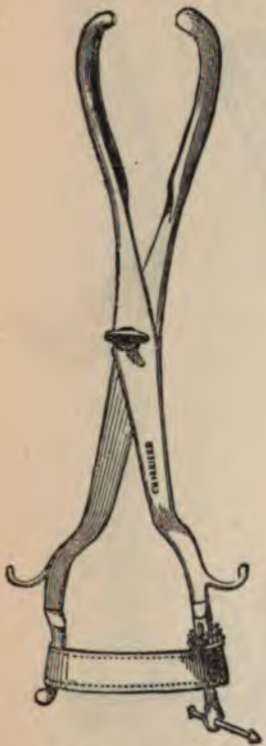


FIG. 146.—CHAILLY'S CEPHALOTRIBE.

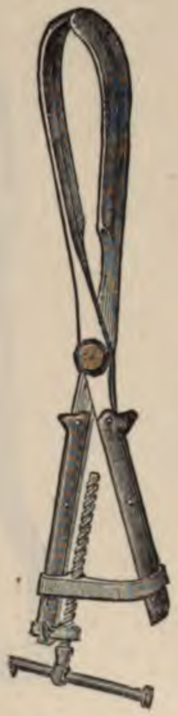


FIG. 147.—SCANZONI'S CEPHALOTRIBE. (Closed.)

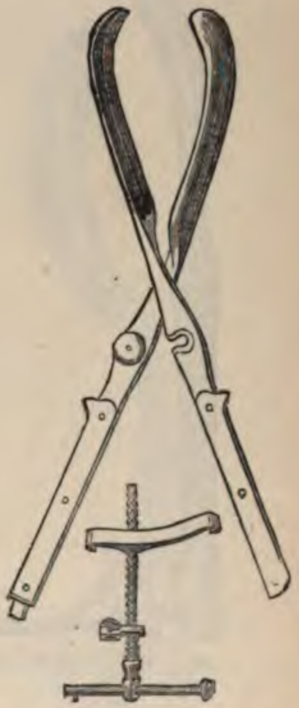


FIG. 148.—SCANZONI'S CEPHALOTRIBE. (Disarticulated.)

crush the head, it is only necessary to turn the screw, and the blades are approximated.

Bailly's cephalotribe (Fig. 150) is thus described by the inventor: "My idea in devising this instrument was to possess one which, while strong enough to crush, would seize the head better than the ordinary cephalotribe My instrument has the form of the forceps and its large and concave blades and, in addition, the power of the cephalotribe. The internal surface of the fenestræ is studded with points, which dig into the head and hold it firmly as compression is made. Antero-posteriorly the breadth of the blades is 2.2 inches. When their extremities are in contact the greatest width between them is 2.1 inches. My cephalotribe, therefore, may be used in contractions of the pelvis between 2½ and 3.7 inches. In contractions below 2½ inches it is not applicable. The compressing mechanism is similar to Blot's."

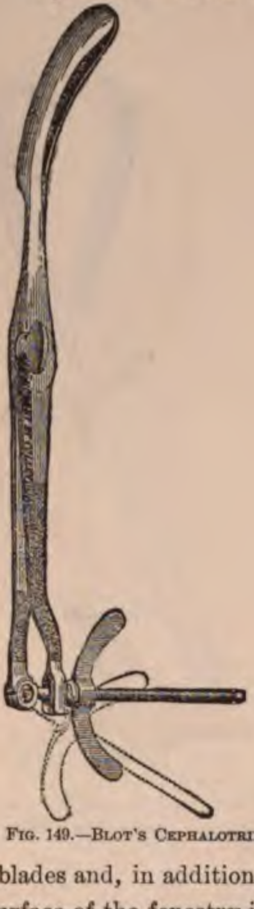


FIG. 149.—BLOT'S CEPHALOTRIBE.

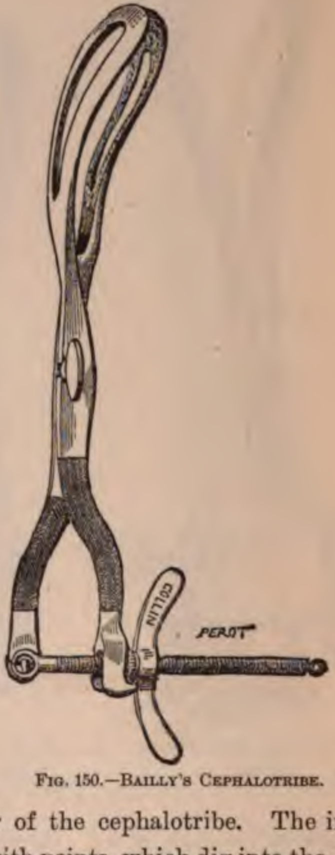


FIG. 150.—BAILLY'S CEPHALOTRIBE.

For our part, we can affirm that between these limits Bailly's cephalotribe is an excellent instrument. We have used it in twenty-three instances: 17 times in vertex presentations, 5 times in face (once with coincident prolapse of a limb), and once where a large fibroma obstructed delivery. The instrument has never slipped, and we have always been able to extract the head. The only possible objection to it, indeed, is the fact that its utility is limited to the lesser degrees of contraction.

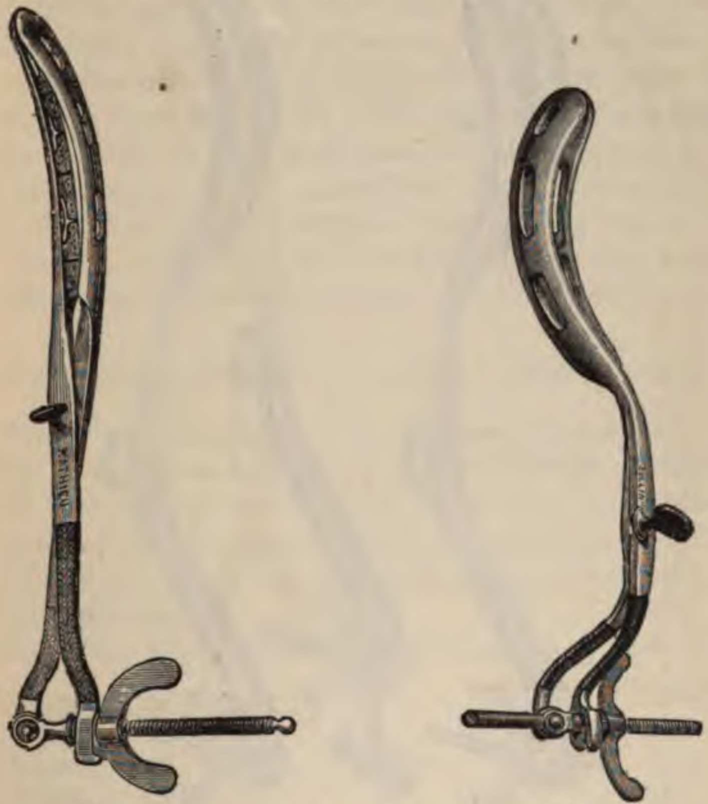


FIG. 151. FIG. 152.

FIGS. 151 and 152.—TARNIER'S CEPHALOTRIBES.

Tarnier's Cephalotribe.—Tarnier has invented a number of cephalotribes. (Figs. 151–153.) One of his modifications is furnished with a number of transverse projections to grasp and firmly hold the head; in another he has added a perineal curve; in his last model he has modified Blot's lock, so as to render it easier to adjust the compressing bar.

[Lusk has devised an excellent and effective instrument, which presents certain advantages over Blot's. It has a cephalic curve of 2¼ inches. Th pelvic curve is a trifle beyond 3 inches in length. The blades are fene trated, and are grooved on the inner surface. With this instrument it possible to grasp the head above the pelvic brim, and since, after the hea has been crushed, "the points approach each other closely, the instrumen becomes a perfect tractor, holding the head as securely as an ordinary forceps. Its construction is, however, the abandonment of two favorite but chimerical ideas regarding the capacity and mode of action of the cephalotribe, *viz.*, that it is capable of flattening the head so that the latter can be drawn through a pelvis measuring but two inches in the conjugate diameter, and that this can be accomplished by rotating the in-

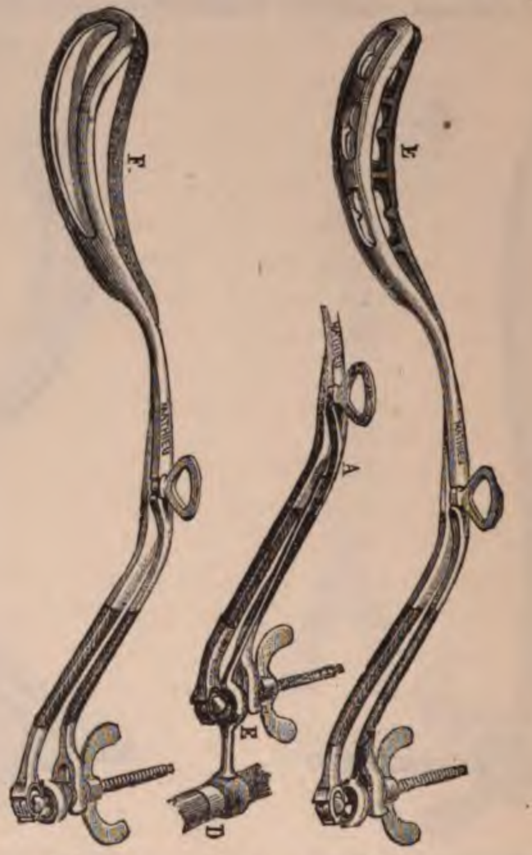


Fig. 153. Fig. 154. Fig. 155.
Figs. 153, 154 and 155.—Tarnier's Cephalotribes with Perineal Curve.

strument, so as to make the flattened head correspond to the shortened diameter of the pelvis." (Lusk.) Lusk's instrument, further, is less bulky than any, actually so efficient, as yet devised.—Ed.]

Indications.—Cephalotripsy is indicated whenever delivery is impossible, without mutilation of the fœtus. Benoit in his thesis, 1881, divides the indications into the following categories: 1. Those from the side of the mother. 2. Those from the side of the child. 3. Those dependent on both. Before studying the indications, we wish to emphasize our previous statement, that before resorting to cephalotripsy we ought, whenever the pelvis allows, to make one to two attempts at delivery with forceps, always within the limits of prudence, and that only when we have thus assured ourselves of the impossibility of delivery without mutilation are we justified in first perforating and then crushing the head. In many instances, we would also add, it is advantageous to allow a number of hours to elapse after perforation, before using the cephalotribe.

1. *Indications from the Side of the Mother.—Pelvic Deformity.*

a. *Pelves of* 3.9 *to* 3 *inches.*—The operation is only exceptionally called for, since forceps and version ordinarily suffice for delivery. In case the infant is dead, however, it is preferable to resort to the cephalotribe, since thus the mother is spared the risk of energetic tractions.

b. *Pelves of* 3.3 *to* 2.7 *inches.*—First try the forceps, then the perforator and Bailly's cephalotribe.

In this instance the cephalotribe gives fairly satisfactory results.

Lauth	in 50 cases, . . .	Mortality	32%
Rigaud	" 22 " . . .	"	50%
Stanesco	" 33 " . . .	"	24%
Bénoit	" 14 " . . .	"	14.28%

c. *Pelves of* 2.34 *to* 1.93 *inches.*—The forceps has little chance of success. With the cephalotribe Stanesco, in 18 cases, had a mortality of 22.22 per cent.

d. *Pelves of at least* 2.5 *inches.*—Authorities differ as to the choice of methods. It is our opinion that the cephalotribe should be used as long as it will pass. Stanesco gives the following figures: Pelves from 2.5 to 2.15 inches, mortality 41.17 per cent.; pelves of 2.15 inches, 3 cases with 3 recoveries. Maygrier gives the following figures:

Pelvic measurement,	2.54 in.	Cases	32	Mortality	40.62%
"	2.45 in.	"	1		
"	2.42 in.	"	1		
"	2.38 in.	"	2	"	50. %
"	2.34 in.	"	20	"	50. %
"	2.3 in.	"	1		
"	2.22 in.	"	1	"	100 %
"	2.15 in.	"	4	"	25 %
"	2.1 in.	"	1		
"	1.9 in.	"	3	"	33.33%
"	1.4 in.	"	1	"	100 %

As was to be expected, the mortality rate increases with the degree of contraction, as also the difficulty of the operation. To obviate this Pajot proposed repeated cephalotripsy without traction. In reference to this operation, he says: "Struck by the numerous failures of cephalotripsy in exaggerated pelvic contractions, remembering the deplorable consequences for the women of the use of excessive force, and objecting to the Cæsarean section practised from choice and not from necessity, I have proposed a new method under the name of 'repeated cephalotripsy without traction.' After the skull has been perforated, the first application of the cephalotribe should be made as early as possible, with the usual precautions. After crushing the head, I endeavor to turn it by means of the instrument, so as to place the diminished diameter in the contracted portion of the pelvis. If this rotation cannot be made with ease I abstain, for experience has taught me that the uterus itself will usually mold the diminished head and rotate it, with less risk of injury than by artificial rotation. The instrument is to be withdrawn without making any attempt at traction whatsoever; it is reapplied a second and a third time, the head again crushed, and after each crushing the instrument is withdrawn, always without traction. The woman is placed in bed, and according to her general condition and the uterine contractions, I repeat these multiple crushings every two, three, or four hours. When the head has been completely crushed, the trunk ordinarily presents obstacles which necessitate one to two crushings. By this method I have had six successes in eight cases, in the presence of extreme pelvic deformity, where many accoucheurs would have resorted to the Cæsarean section."

e. *Pelves contracted at the Inferior Strait or in the Excavation, by Tumors, Exostoses, Spondylizema, Spondylolisthesis.*—It is impossible to fix exact limits. Everything depends on the degree of contraction. The same holds true of fibrous tumors, osteo-sarcomata, etc.

2. *Indications from the Side of the Fœtus.*

Such are excess of volume of the head, advanced ossification of the skull, complicated or irregular presentations, in particular those of the face, fœtal monstrosities, the death of the fœtus, etc.

As for the contra-indications to cephalotripsy, we know of but one, and this is the opposition of the mother. In such an instance we must either let the woman die undelivered, or else resort to the Cæsarean section.

The operation is performed in four stages: 1. Insertion of the blades. 2. Locking of the blades. 3. Crushing of the head. 4. Extraction, where Pajot's method is not followed.

Introduction of the Blades.—The woman having been anæsthetized and placed in the obstetrical position, the head, perforated or not, (it is our practice always to precede cephalotripsy by perforation), is to be steadied at the superior strait by an assistant. The blades are to be inserted so as to grasp the head firmly by its base, in order to crush it at its most resisting part. The blades, hence, are usually applied at the sides of the pelvis, and usually, indeed, this is the only way the cephalotribe may be employed, since the pelvic contraction is ordinarily in the antero-posterior diameter of the superior strait, and the greatest space exists at the extremities of the transverse diameter of the pelvis. The rule in a nut-shell, however, is to grasp the head how and where we can, remembering always that the cephalotribe is a thicker and more massive instrument than the forceps, and that the space in which it must work is very limited. Patience and gentleness, therefore, must characterize the insertion of the blades. Down to 2.34 inches Bailly's cephalotribe may be used, and this instrument being scarcely at all different from a strong forceps with narrow blades, the insertion is very much simplified; but below 2.34 inches we are obliged to use Depaul's instrument, or that of Blot or Tarnier, where the blades are narrow, and therefore it is not so easy to grasp the head. Whatever instrument is used, it must be inserted deeply, so as to seize the base of the skull well, and often the lock will be in the vagina.

The general rules for application are identical to those of the forceps, the difficulty, of course, being greater, and frequently the entire hand must be inserted into the vagina.

Locking.—The same rules apply to this procedure as to the forceps, although greater care, if possible, is necessary, for the cephalotribe being more massive than the forceps, the risk of injury to the maternal parts i greater.

Crushing.—As Pajot well says the responsibility of the assistant wh steadies the head is here great, for the classic cephalotribe being very narrow, the head tends to slip and the operation may on this account fail Further still, the assistant is able to appreciate how the head has bee grasped.

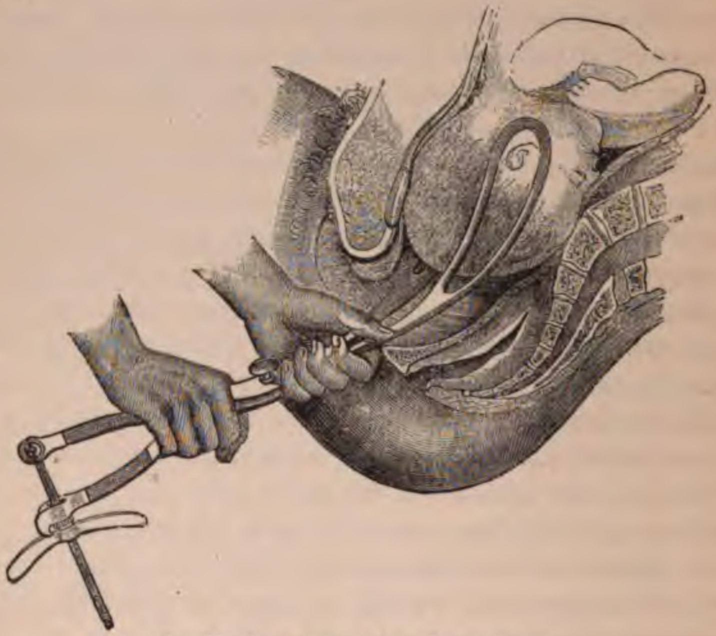


FIG. 156.—APPLICATION OF THE CEPHALOTRIBE.

The process of crushing should be slow and intermittent, and should be kept up until the handles of the instrument have been brought into contact. As the head collapses and the cerebral matter escapes, compression must be more energetic, or else the instrument will slip at the first traction.

Extraction.—After an interval of a few minutes, the cephalotribe should be seized in both hands, and rotated so as to bring the lesser curve of the instrument towards one or another thigh of the mother. (Fig. 156.) This movement aims at bringing the crushed diameter of the head into the conjugate—that is to say, the most contracted diameter of the pelvis.

The head having been crushed in one direction, elongates in the other, and this elongation is in the conjugate of the pelvis. Tractions are then made, and these must be slow, sustained, combined with lateral movements. Ordinarily, the instrument rotates itself as the head engages, and we must favor this spontaneous rotation. The head once in the cavity, rotation in the inverse direction is made, and thus the lesser curve of the instrument is brought under the symphysis. Traction, even as with the forceps, should always be made in the pelvic axis, and during delivery the perineum should be as carefully watched. The head once delivered, the body follows quickly, except in case of great contraction. "We may then," says Pajot, "apply the cephalotribe on the thorax, or else, by traction on the body and rotation of a shoulder under the symphysis, we may be able to hook a finger in the axilla, bring down an arm, and thus deliver."

Each of these periods may offer difficulties which render cephalotripsy one of the most delicate operations in obstetrics. It is often extremely difficult to place the blades, and it may be necessary to attempt the passage several times before our efforts meet with success. The irregularity of the pelvis and the narrowness increase the difficulty, whence the necessity of proceeding slowly, pushing the blades in deeply, making sure that the head is well grasped. A capital point to be remembered is, as Pajot points out, the necessity of carrying the handles as far backwards as is possible, in order to assure grasping and crushing of the base of the skull.

Bailly's instrument is, we think, the one which best enables us to accomplish our aim, owing to the breadth of the blades and the greater concavity. The head is thus grasped the better, and cannot so readily escape from the instrument. Where the pelvis is greatly contracted, however, if the blades are not carried sufficiently backwards, their extremities touch the posterior pelvic wall, and the projecting sacro-vertebral angle. Here it is that repeated attempts at application of the blades are necessary, and however gently these are made, the risk of injury to the maternal parts is greatly enhanced. The danger from cephalotripsy, therefore, increases greatly in direct proportion to the degree of pelvic deformity.

Generally, with Bailly's cephalotribe, locking is not difficult, but the same does not hold true of the classic instrument, on account of the narrowness of the blades.

During crushing, slipping of the head is more likely as it is badly grasped and movable. The chief difficulty, however, is to crush the base of the skull. With Bailly's instrument, whenever it can be used, we are able to obtain most readily complete destruction of the base. During extraction, the chief thing to guard against is slipping, which may cause such injury to the maternal parts. It is to avoid this risk that Tarnier and Bertin have proposed, after a few attempts at extraction, if the head does not engage, to resort to podalic version. The objection we would make to this proposal, is that the uterus is often retracted on the fœtus, and that version is hence impossible without running great risk of rupturing the uterus. Further still, version is far from being practicable in every pelvis.

Prognosis.—One of the risks resulting from cephalotripsy and perforation is from the spiculæ of bone which project, and may injure the maternal parts. These must, hence, be removed with care before exerting traction. Otherwise the lesions which may follow cephalotripsy are the same as those likely to be caused by the forceps, and the more readily since it is a bulkier instrument, and the field of manipulation is more limited.

The prognosis, indeed, is very grave. Rigaud places the mortality at 50 per cent.; Stanesco at 33.72 per cent.; at the Clinic, during thirty years, we find the average to be 28.21 per cent.; Maygrier puts it down as 41.79 per cent.; Sickel as 22.75 per cent.; English authors as low as 12.5 per cent., but certain among them never use the forceps, but resort at once to the cephalotribe as soon as delivery does not occur spontaneously. [The author gives no authority for this statement. Certainly no English-speaking obstetrician of the present day would practise or seek to justify such unwarrantable destruction of the fœtus.—Ed.]

In 1881 Castelain (Lille) proposed to perform cephalotripsy not on the before-coming, but on the after-coming head—that is to say, first to try the forceps; if this fails, version, followed by cephalotripsy. He divided pelves into the following categories, from the standpoint of this advice:

1. Pelves of at least 3.3 inches; forceps or version, cephalotripsy only exceptionally.
2. Pelves from 3.3 to 2.7 inches; the forceps, this failing version followed by cephalotripsy.
3. Pelves from 2.7 to 2 inches; the same procedures.
4. Pelves below 2 inches; Cæsarean section.

The chief utility of the method he advocates consists in the fact that thus it is possible to grasp the skull by its base. In four cases where it was tried at the Lille Maternity, there were four recoveries.

Although we admit, in a measure, the value of version in the lesser degrees of contraction, since we may thus hope to obtain a living child, and still be able to resort to cephalotripsy if need be, below 2.7 inches we reject it, for, as Castelain himself observes, the head can certainly not pass by the contraction. The only way, in these instances, to obtain a living child is by the Cæsarean section, and to this operation, as we have stated, we prefer cephalotripsy. [The time has not as yet arrived for positive statement, but we believe that the drift of opinion is towards the Cæsarean section or laparo-elytrotomy in every case where the infant is living, in place of cephalotripsy or other operation which of necessity sacrifices the fœtus. It only remains to be shown that the risk to the mother is not thereby enhanced, and obstetricians have only to learn the advisability of not waiting too long before resort to one or another of the operations which take account of the child's life as well, and then both cephalotripsy and cranioclasty and embryotomy will be relegated to what we believe is their proper sphere, cases where the fœtus is dead. Such will be the verdict in the near future.—Ed.]

We reject absolutely, however, version as a preparatory step to cephalotripsy. Version practised in deformed pelvis is an extremely difficult operation, and one which by itself alone exposes the mother to great risks. To resort to it before cephalotripsy, is simply to expose the woman to two risks instead of to one, which by itself is grave enough. It is true that in Castelain's three cases the women recovered, but three cases are not sufficient to warrant the justifiability of a new method. As to the advantages which result from the ability of crushing the base of the skull, they are incontestable, but we believe that by pushing the blades in deeply enough, the before-coming head may be grasped sufficiently to enable us to crush it thoroughly. In very contracted pelves, it is to Pajot's method of repeated cephalotripsy to which we should have recourse, remembering the point on which Pajot insists, that after each act the head should be placed in a different position, so that the instrument may grasp it differently. To add version to these repeated cephalotripsies in pelves measuring from 2.7 to 2 inches, seems to us to act directly contrary to our aim, the succor of the mother.

III. CRANIOCLASTY.

Devised by Simpson in 1860, the cranioclast is in reality a bone-forceps. [The name *craniotractor*, suggested by Mundé, is peculiarly appropriate, since it describes the action of the instrument exactly.—Ed.]

The instrument is composed of two blades, (Fig. 157), the one smooth and fenestrated, the other solid and roughened, fitting into the first. When closed, the blades, slightly curved, resemble, as Guéniot says, the bill of a duck.

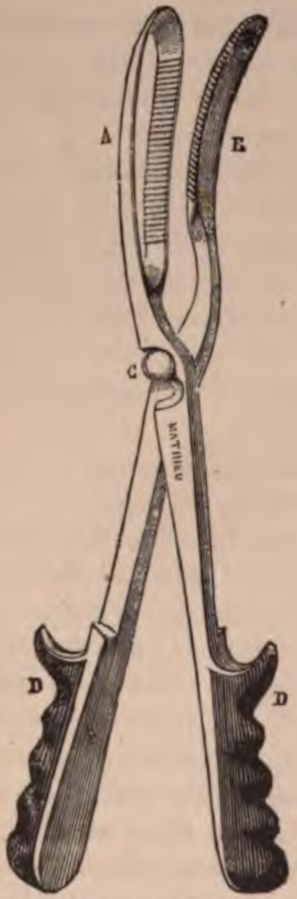


FIG. 157.—SIMPSON'S CRANIOCLAST.

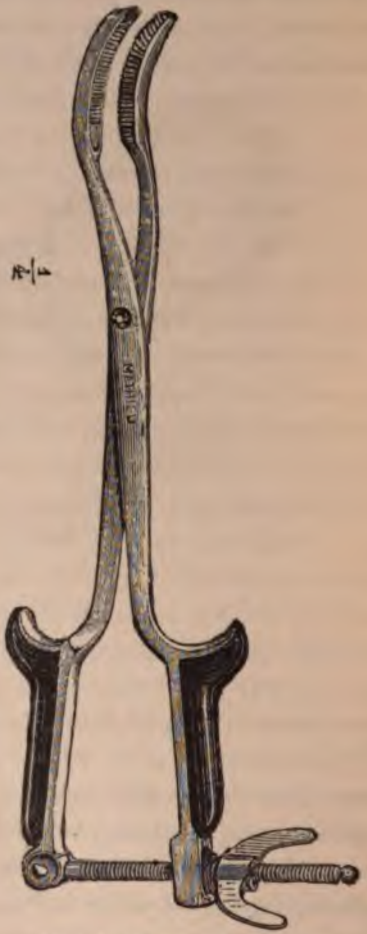


FIG. 158.—C. BRAUN'S CRANIOCLAST.

The use of the instrument is preceded by perforation, and then the solid blade is applied within the skull, the fenestrated externally, and through their approximation, the bones are crushed. The instrument may then be withdrawn and the expulsion of the head be left to Nature, or else it may be used as a tractor, and delivery thus completed.

The objections to Simpson's instrument are that it is too short, and therefore can scarcely be used above the superior strait, and further its lack of curve. Braün has lengthened and curved it, and has added a compression screw. (Fig. 158.) [These modifications make Braün's instrument not only an efficient *tractor*, but also an efficient *compressor*. Being lighter and less bulky than the cephalotribe, and accomplishing the same end, we personally prefer it, especially since it may be used in cases of deformity where the cephalotribe, on account of its bulk, cannot.—Ed.]

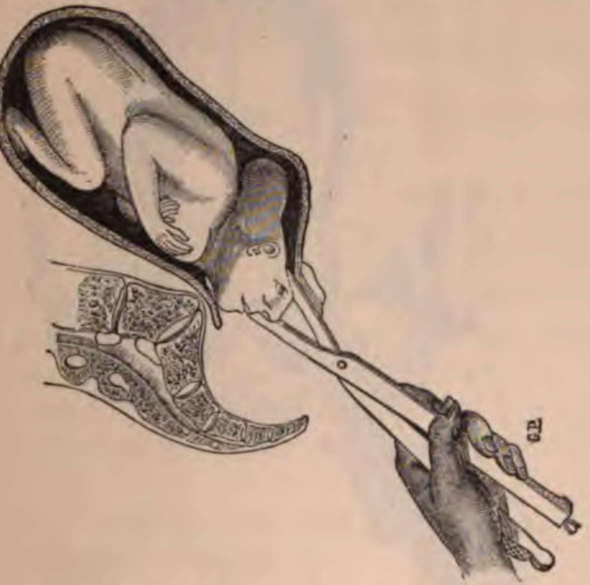


FIG. 159.—THE BONES OF THE VAULT HAVE BEEN REMOVED, AND THE BASE OF THE SKULL IS GRASPED BY THE INSTRUMENT. THE HEAD, FACE FIRST, IS BEING DRAWN THROUGH THE CONTRACTED STRAIT.

Wasseige thus states the advantages of the cranioclast: 1. It is a smaller instrument than the cephalotribe. 2. We may make traction with it as readily as by the body of the fœtus. 3. The instrument rarely produces any lesions of the maternal parts. 4. It never slips, and if perforation has been effective, it always delivers. 5. Braün's instrument may be used in cases where the contraction at the superior strait is as low as 1.5 inches. 6. It may be used in case of all presentations. 7. It may be applied on hemicephalic and acephalic fœtuses.

Barnes, who is a great advocate of the cranioclast, recommends, before traction, the removal of portions of the vault. Burnes, contrary to the assertions of Hull, has shown that the removal of the vault reduces the base of the skull, and that if the head be brought down even as in cas of face presentation, only the diameter between the orbits and the chi presents at the strait, and this diameter is scarcely one inch. If then the conjugate is 1.5 inches, and the transverse 3 inches, cranioclasty is sufficient for delivery. Below this the Cæsarean section is requisite.

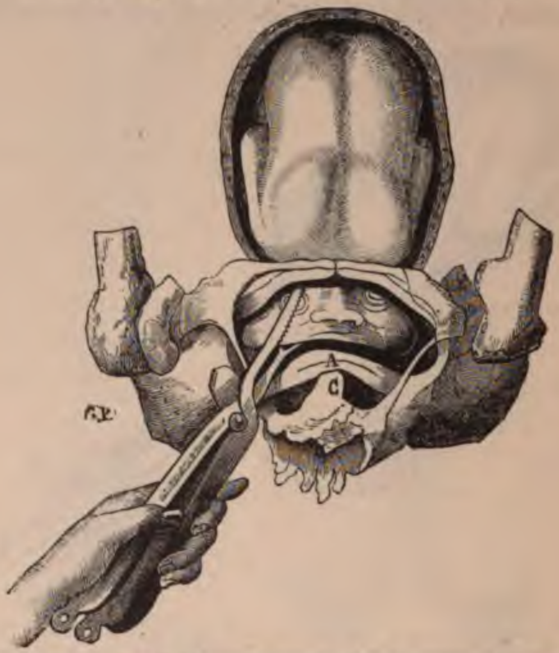


FIG. 160.—THE CRANIAL VAULT HAS BEEN REMOVED, THE REMAINDER IS BEING DRAWN THROUGH THE STRAIT. *A*, Promontory. *C*, Coccyx.

Although the inventor of the cranioclast, Simpson much prefers version, and he bases this preference on the following figures: Cranioclasty 251 cases, mortality 1 in 5; version 169 cases, mortality 1 in 15. Further, he states that, *ceteris paribus*, version is resorted to earlier than craniotomy, and, therefore, will offer greater chance of success, the maternal mortality increasing always with the duration of labor.

Since 1862, the cranioclast tends in Germany to replace the cephalotribe, and Braün uses it exclusively. Rokitansky, up to 1871, had used it 52 times in Braün's Clinic: before-coming head 47 times; after-coming head 5 times.

Braün, from 1871 to 1878, used it 82 times: Before-coming head 63 times; after-coming head 19 times. Mothers recovered 59; mothers died 23. Of the 23 deaths, 6 were in good condition before operation, and 17 in bad condition.

The causes of death were: Eclampsia 1; peritonitis 6; physometra 2; spontaneous rupture of uterus before operation 14.

Bidder, from 1873 to 1875, has used the instrument 32 times successfully.

Fritsch has used it 41 times, with 7 deaths. Braün always perforates with the trephine.

[The trephine best subserves the purpose of perforation of the before-coming head, and Naegelé's scissors of the after-coming. After perforation with either, a sound or similar blunt-pointed instrument should be inserted into the skull, and the brain thoroughly broken up, especially the medulla, lest a gasping, still-living infant, be brought into the world to the horror of the attendants.—Ed.]

Wiener, of Breslau, comparing the results obtained from cranioclasty and cephalotripsy at the Clinic, from 1865 to 1876, gives the following figures:

Perforations, 101: Before-coming head, 92; after-coming head, 9. Primiparæ, 41; biparæ, 25; triparæ, 18.

Presentations, 92: vertex, 1st position, 50; 2d position, 34; face, 1st position, 3; brow, 1st position, 2; brow, 2d position, 3.

Head above superior strait, 47: occiput, 24; sinciput, 20; posterior parietal, 3.

Head at the superior strait, 13: Occiput, 5; sinciput, 4; posterior parietal, 4.

Head deeply engaged, 26: Occiput, 15; sinciput, 9; posterior parietal, 1; brow, 1.

Head in excavation, 10: Occiput, 8; brow, 1; face, 1.

Operation was performed: After the death of fœtus, 36 times; mother in critical state, 39; prolonged labor, 23; putrefaction of fœtus, 10; septic peritonitis, 1; eclampsia, 1; chorea, with affection of heart, 1.

In twenty instances many attempts at delivery with forceps had been made before perforation, the head above the brim. The results were: Died, 2; vesico-vaginal fistula, 1; vesico-uterine fistula, 1.

Version had been attempted in 4: Died, 2; recovered, 2.

Degree of pelvic deformity: 1st degree, simple flattened, 12; 2d degree, simple flattened, 14; 1st degree generally contracted, 17; 2d degree generally contracted, 39; 3d degree generally contracted, 4; funnel-shaped, 9; oblique-oval, 1; transversely contracted, 1.

Except in 9 cases where, after perforation, labor was allowed to terminate spontaneously, extraction was always resorted to. Until 1871 the blunt hook or the cephalotribe was used for extraction. Since then the cranioclast has been used.

Extraction with blunt hook, 20; extraction with cephalotribe, 17; extraction with cranioclast, 39; extraction with forceps 6.

While extraction with the cephalotribe succeeded 17 times and failed 11, the cranioclast succeeded 33 times and failed in only 7 instances. The cases in which the cranioclast was used are thus decomposed: Head above the brim, 19; head movable at the brim, 3; head fixed at the brim, 8; head in cavity, 8.

Where the cranioclast failed, labor was terminated by: Version and extraction, 3; cephalotribe, 2; forceps, 1; Cæsarean section, 1.

Where the cephalotribe failed, termination by: Blunt hook, 1; version and extraction, 2; cranioclast, 5; forceps, 2; post-mortem section, 1.

The characteristics of the puerperium were:

After cephalotripsy: Normal, 2; diphtheritic ulcers, 2; endometritis, 3; phlebitis, 1; vesico-vaginal fistulæ, 1; left parametritis, 1.

After cranioclasty: Normal, 15; intestinal catarrh, 1; abscess of left arm, 1; endometritis, 1; septicæmia, left pleurisy, 1; fever, 2; vesico-vaginal fistulæ, 4.

After blunt hook: Peritonitis, 4; endometritis, 5.

The total maternal mortality was 25.7 per cent. thus: Of 26 maternal deaths after: Cephalotripsy, 7; cranioclasty, 7; forceps, 3; blunt hook, 3; version, 3; traction on perforated head, 1; during extraction, 1; unknown, 1.

Wiener draws the following conclusions:

1. As soon as the necessity of perforation is evident, every other method of delivery, in particular the forceps, should be rejected.

2. Extraction should always follow perforation.

3. The objections to the cephalotribe are:

a. Risk of slipping. *b*. Augmentation of the diameter of the head in one direction, and decrease in the opposite. *c*. Frequent injuries of the maternal parts. *d*. Grave troubles more frequently follow its use than that of the cranioclast.

4. The advantages of the cranioclast are: *a*. It never slips if the internal blade be carried high towards the base of the skull, and the external blade grasps the head over the ear and maxilla. *b*. It may be used in a smaller space and the operator may place it where he pleases. *c*. It injures the mother less frequently than the cephalotribe. *d*. It diminishes the base of the skull.

Credé, without detracting from the value of the cranioclast, prefers the cephalotribe, because he has been enabled by it to end labor where the cranioclast had been tried in vain. In Italy, Fabri and Cuzzi, from a series of experiments with Braün's cranioclast, limit the utility of the instrument to instances where the sacro-pubic-diameter is not below 2.3 inches, and Cuzzi adds that if Rokitansky was able to succeed in greater degrees of contraction, it was because the fœtuses had been dead for some time, and the bones and the sutures were, therefore, very movable.

Narich proposes the following procedure: Extend the head by introducing the fenestrated blade between the pelvic walls and the fœtal face, and using it as a lever. Then perforate about ½ inch above the root of the nose. Make tractions downwards, accompanied by rotation, which will bring the bi-malar diameter towards one or another side of the sacral excavation. We may thus use the cranioclast in cases where the conjugate is diminished even down to 1½ inches.

If the objections to the cephalotribe are true when applied to the classic instrument, they are not at all applicable to Bailly's instrument, except, unfortunately, that it cannot be used in pelves diminished below 2.5 inches. We have used it fully fifteen times, and it has never slipped, has always extracted the head, has always crushed the base of the skull when the blades were inserted deeply enough. We have lost but two women, and in these repeated attempts at delivery had been made before they were seen by us. It should be remembered that Narich's experiments were made on a bronze pelvis, and surely the conditions in the living woman are very different. Whatever the results obtained in

Germany, the cranioclast, we think, should remain an instrument of exceptional utility. Above 2.5 inches we would recommend Bailly's cephalotribe, and below 2.5 inches the cranioclast.

[We have not often, we are very thankful to say, been obliged to mutilate the living fœtus, and, therefore, we cannot dogmatize in regard to the superiority of the cranioclast over the cephalotribe, and *vice versâ*, although we prefer the former instrument. Our general practice is, where the case is seen in time (before or just after rupture of the membranes, and before engagement), to perform bi-polar version and endeavor to extract where the conjugate is not diminished below 2¾ to 3 inches at the brim. Thus we may possibly obtain a living child, and if we cannot extract we can still perforate. Below 2¾ inches the cranioclast is just as effective an instrument as the cephalotribe, and being less bulky is far less likely to injure the maternal parts. Why then ever use the cephalotribe? Thorough perforation and evacuation of the cerebral matter, followed by careful insertion of Braün's cranioclast and crushing by means of it, will certainly accomplish all that the cephalotribe can, and not do what the cephalotribe may, damage the mother.

Such we believe to be sound practice, for the present. We repeat, however, that we look forward to the approach of the day when custom will sanction resort to an operation in case of the living infant which will give it a chance and yet not increase the maternal risk.—Ed.]

IV. Sawing of the Head, or Cephalotomy.

In 1842, struck by the risk of damage resulting from the projection of spiculæ of bone after perforation and cephalotripsy, Van Huevel devised a saw-forceps which permits of sawing into the head without splintering it. His instrument (Fig. 161) has been repeatedly used by himself, and Hyernaux, who advocates the instrument strongly, says: "It is now twenty-four years since Van Huevel devised his instrument, and we can vouch for its frequent success in cases where there was contraction even down to 1.5 inches, its limit of application."

Didot (Liége) has modified Van Huevel's saw-forceps, and has devised what he calls a *diatrypteur*, an instrument resembling a glove stretcher. It has never been used on the living.

Tarnier has caused the construction of two models of a saw-forceps, with parallel blades. The one (Fig. 162) has a single chain saw and is similar to Van Huevel's instruments; the other (Fig. 163) has two chains which move at the same time and cross one another, so that after the sawing the section of bone is loose and may be at once extracted. The removed portion has the shape of a cone, with a base a trifle over $\frac{1}{2}$ inch in thickness. In his experiments, Tarnier was able to extract, from a

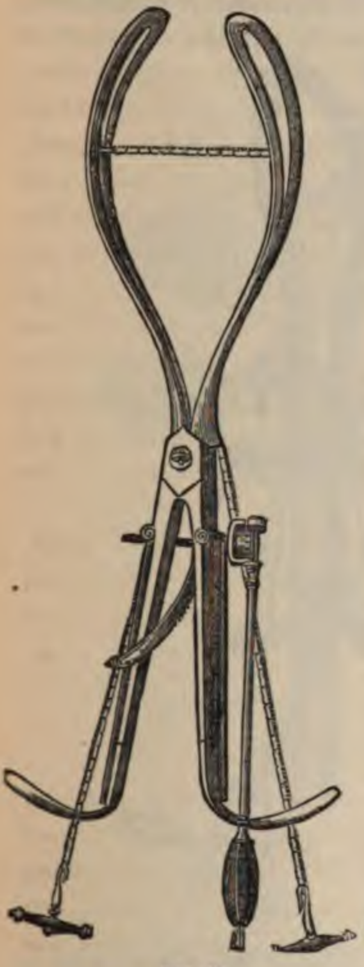


FIG. 161.

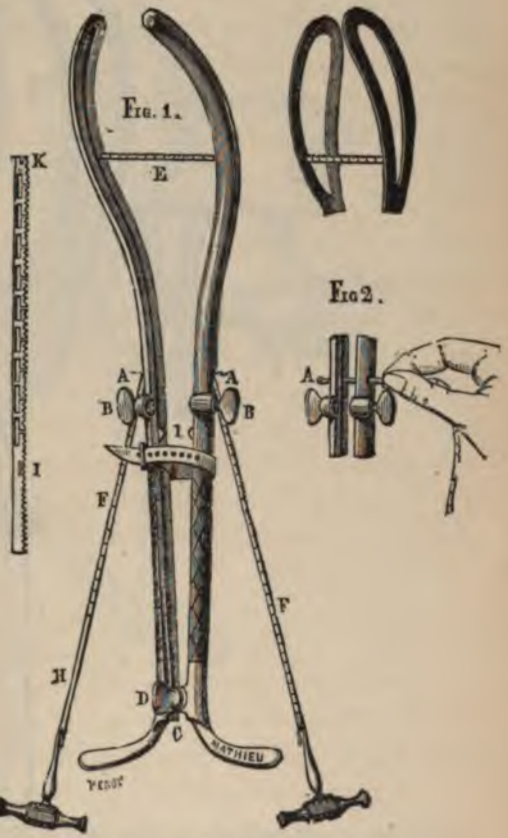


FIG. 162.

FIG. 161.—VAN HUEVEL'S SAW-FORCEPS. FIG. 162.—SAW-FORCEPS WITH SINGLE CHAIN OF TARNIER. 1, *A*, Holes through which the chain passes. *B*, Key. *C*, Opening for passage of conductor. *D*, Lock. *E*, Chain saw. *FF*, Handle of saw. *IK*, Flexible conductor. 2, Insertion of chain saw through openings.

wooden box through an opening 2½ inches long by ½ inch broad, the cadaver of a fœtus after three successive applications of his saw-forceps, a result not practicable with any other instrument.

The saw-forceps is open to a number of objections: it is difficult to handle; where the pelvis is much contracted, a long time is requisite for completion of the operation; it is not an instrument for extraction; it is very expensive.

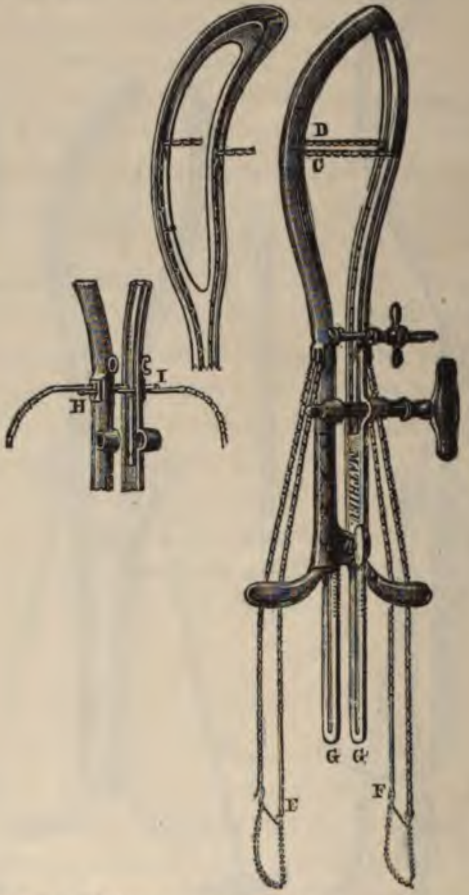


FIG. 163.—DOUBLE CHAIN SAW-FORCEPS OF TARNIER. *A*, Key. *B*, Screw bringing together the blades. *CD*, Chain saw. *EF*, Ends of chain. *GG*, Ends of conducting rods. *HI*, Chain saw passing through openings.

In case of extreme contraction, Barnes uses a *serre-nœud* and a metallic cord, and has operated by means of these in a rachitic pelvis measuring not quite an inch in the sacro-pubic diameter. He thus describes his method: "Even as in cephalotripsy, it is useful first to perforate. It further facilitates the operation to twist off a portion of the parietal bones by the cranioclast. The wire loop thus buries itself more deeply, and it cuts its way through more readily. If the sphericity of the head is not first destroyed, the wire loop is apt to glide off the head, seizing only the scalp when the screw is worked. The crotchet is next passed into the hole made by the perforator and held by an assistant, so as to steady the head. (Fig. 164.) A loop of strong steel wire is then formed large enough to encircle the head. The loop is guided over the crotchet to the side of the uterus where the face lies. The compression being

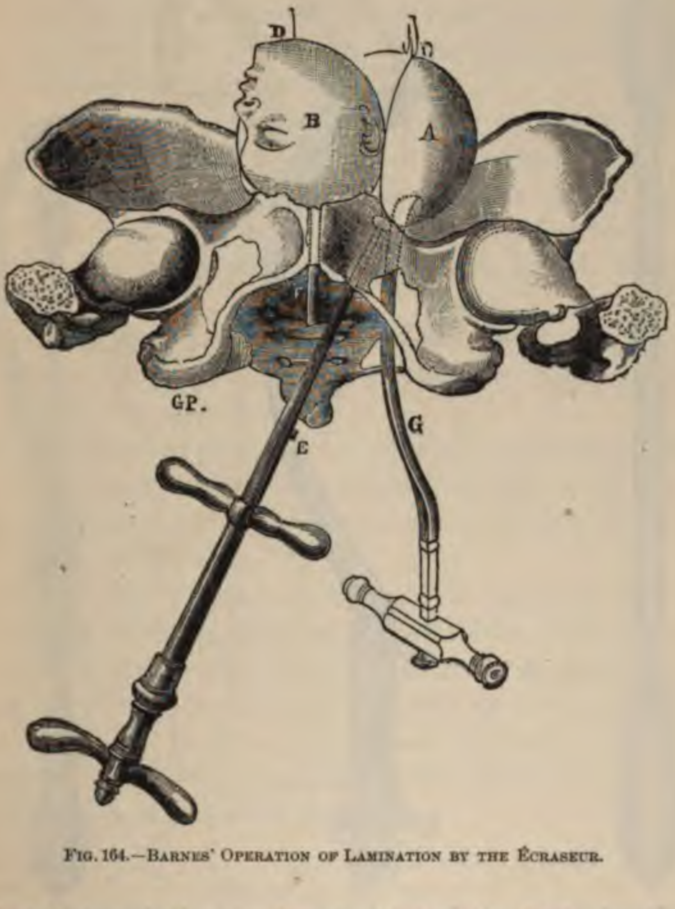


FIG. 164.—BARNES' OPERATION OF LAMINATION BY THE ÉCRASEUR.

removed, the loop springs open to form its original ring. This is gui over the anterior part of the head (See Fig. B). The screw is then tig ened and the wire is buried in the scalp. The whole force of the m œuvres is expended on the fœtus; there is no outward pressure on

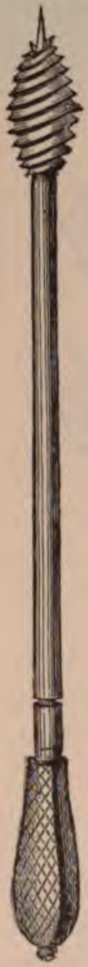


FIG. 165.—HUBERT'S PERFORATOR (TEREBELLUM.)

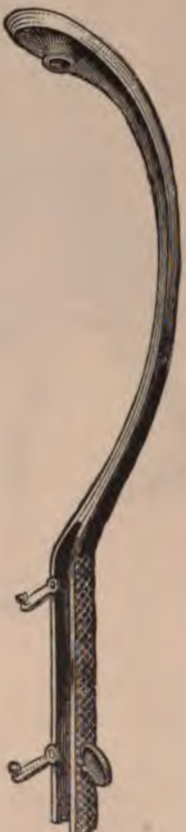


FIG. 166.—PROTECTING BLADE.

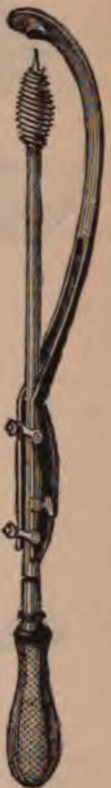


FIG. 167.—HUBERT'S TRANSFORA (Complete.)

maternal parts, as is inevitable with the cephalotribe or Van Huev saw-forceps. A steady working of the screw cuts through the head i few minutes. The loose segment is then removed by the cranioclast. minor degrees of contraction the removal of one segment is enough enable the rest of the head to be extracted by the cranioclast. But in cases of extreme distortion it is desirable to still further reduce the head by taking off another section. This is best done by re-applying the loop over the occipital end of the head (See Fig. A). It thus accomplishes what the cephalotribe does not, it breaks up the base of the skull. The small part of the skull still remaining offers no obstacle. It serves as a hold for traction. The cranioclast seizes it firmly and the delivery of the trunk is proceeded with. If the child be well developed, this task will require considerable skill and patience."

This method appears to us a very difficult one in practice, as much so as the saw-forceps, although theoretically it seems simpler.

We recall, finally, as matters of curiosity, Ritgen's *labitome*, Finizzio's *sego-cefalotomo*, Joulin's *diviseur-cephalique*. The latter was used once on the living; the conductor perforated the uterus, and the woman died in a few hours.

It remains for us to describe the *transforation* of Hubert, and the intracranial cephalotripsy of Guyon, which methods are included by Guéniot under the term *sape-sphenoidienne*.

Hubert's transforator (Fig. 167) is composed of a *terebellum*, a steel rod at the end of which is a pear-shaped, sharply pointed screw, and a protecting blade about 1 inch thick, the extremity of which is perforated for the passage of the terebellum.

By means of this instrument numerous holes may be drilled into the skull, and then either expulsion be left to Nature, or else delivery by traction may be resorted to. With the transforator E. Hubert states the maternal mortality to be only 11.62 per cent., against 22 per cent. with the saw-forceps, and 18 per cent. the lowest obtained by cephalotripsy. Hubert gives the following comparative tables, which show at a glance the results obtained by these three methods.

Craniotomy in General.

	Cephalotribe. 235 cases.	Saw-Forceps, 130 cases.	Transforator. 43 cases.
Deaths	34.46%	22.36%	11.62%
Puerperal accidents	20.42%	26.15%	16.62%
Normal puerperium	45.12%	51.53%	76.42%

Craniotomy in Cases where the Pelvic Measurements are Noted.

	Cephalotribe, 127 cases.	Saw-Forceps 91 cases.	Transforator, 43 cases.
Deaths........................	38.58%	23.07%	11.62%
Puerperal accidents................	18.89%	29.78%	11.62%
Normal puerperium................	24.52%	47.25%	76.42%

Craniotomy in Contractions from 2.5 *to* 3.1 *Inches.*

	Cephalotribe, 46 cases.	Saw-Forceps, 50 cases.	Transforator, 29 cases.
Deaths......................... ...	26.08%	22%	10.34%
Puerperal accidents............ ...	21.73%	30%	10.34%
Normal puerperium................	5.17%	48%	79.31%

Craniotomy in Extreme Contractions, at least 1.8 *Inches.*

	Cephalotribe 24 cases.	Saw-Forceps, 33 cases.	Transforator, 14 cases.
Deaths.............................	54.16%	18.18%	14.28%
Puerperal accidents................	8.33%	33.33%	14.18%
Normal puerperium................	37.51%	48.48%	71.42%

This method, with the transforator, deserves the serious thought of accoucheurs in view of the most excellent results it yielded in the hands of the late Professor Hubert, of Louvain.

Intra-cranial cephalotripsy of Guyon is thus described by Kalindero: "The apparatus consists of two long trepans, and of one small forceps. The instrument is used as follows: The index of the left hand seeks the point of the skull where it is desired to perforate, and the trephine rod (Fig. 168) is guided to this point, and screwed down and into the bone. The large trephine is then adjusted to the rod, and by working it, a round piece of bone is removed. Through the resulting hole the smaller trephine is inserted, carried to the sphenoid bone, the basilar apophysis, and destroys it. The aim of the trephines then is to break up the base of the skull, and this once accomplished, the small forceps is applied in the ordinary manner, and compression of the handles by the hand suffices to crush the head. Before making traction the instrument is rotated to bring the greatest diameter of the head into that of the pelvis, and then extraction is easy.

The instrument has been used six times, in three successfully; in the remaining three, two were already *in extremis*, and the third died at the Necker hospital of sepsis, during the prevalence of an epidemic. The procedure is certainly as harmless as it is ingenious, and the intra-cranial touch allows us to readily trephine the sphenoid bone, but as Guéniot justly remarks "the difficulty is increased in case of obliquity of the head." The capital point of the method is that intra-cranial touch allows us to guide the trephine to the portion of the skull, which we desire to attack.

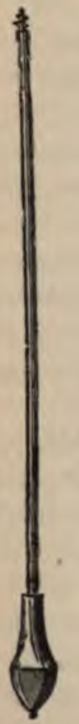


Fig. 168.—Screw Rod.

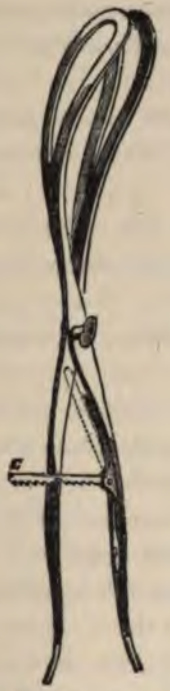


Fig. 169.—Forceps.

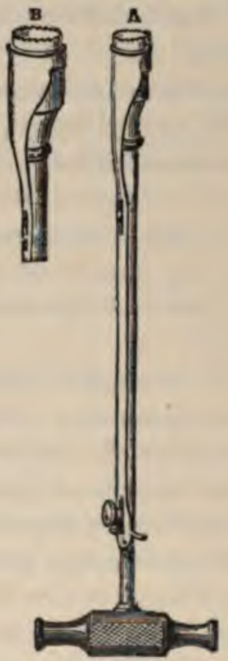


Fig. 170.—Trephines.

V. Embryotomy.

Embryotomy, properly so-called, is an operation which consists in cutting off the neck or the body of the fœtus, when delivery is not possible, either by the forceps, version, or cephalotribe. It is, hence, an operation which is only exceptionally called for. The indications may be summed up under the following heads:

1. In presentation of the shoulder, where version is not practicable, owing to contraction of the uterus, or deep engagement and immobilization of the presenting part.

2. In pelvic contraction where the fœtus cannot be extracted without risk to the mother.

3. In case of monstrosities, where there is excess in size of the fœtus. Of these indications it is unquestionably the first which is the most frequent.

The study of embryotomy has been pursued most completely by Pinard, in 1875, and by Thomas, in 1879. Pinard resumes the contra-indications of version as follows:

A. *Non-dilation of the Cervix.*—The contra-indication is temporary, or else, in certain instances of cancer and fibrous tumors, it is absolute.

B. *Deep Engagement of the Fœtus.*—The contra-indication is absolute.

C. *Tetanic Retraction of the Uterus.*—The contra-indication is similarly absolute.

D. *Extreme pelvic Contraction.*—Version contra-indicated in all pelves measuring less than 2.73 inches, if the infant is living; version is allowable whenever the hand can be introduced, if the infant is dead; below 2 inches version is not possible. The same rule applies in case of any osseous tumor obstructing the parturient canal.

We cannot accept in its entirety this classification, and although we share Pinard's opinion in regard to the three first indications for embryotomy, where version is impossible, we are absolutely at variance with him in case the infant is dead. In presence of the difficulty of version in contracted pelves, in presence of the death of the fœtus, it is not to version we would resort, but to embryotomy, in particular to decapitation. When carefully performed, decapitation is without risk to the mother; in 7 cases where we have resorted to it, in slight degrees of pelvic deformity, it is true, we have had 7 recoveries. Evisceration, eventration, on the contrary, is much more grave, and in the three cases where we have performed it, we have had but a single recovery. To attempt version, however, where the infant is dead, and where there is marked pelvic contraction, seems to us just as grave a procedure as eventration.

The operations which may be performed on the fœtus in presentation of the shoulder are:

1. Decapitation, detruncation.
2. Section through the entire body.
3. Evisceration.
4. Section of the vertebral column, or spondylotomy.
5. Section of the upper extremities, or brachiotomy.

Detruncation is certainly the simplest of all these operations, but unfortunately it is not always possible to reach the neck.

Although embryotomy has been practised from the earliest times, since it may be found mentioned by Hippocrates, it is only since the beginning of the present century that precise rules for its performance have been formulated, so that we are in a position to state definitively the aim of each one of the possible procedures. Pinard ranges these aims in the following categories:

1. Evisceration or exenteration, preceded or not by brachiotomy, aiming at forced version.
2. Evisceration or exenteration, without brachiotomy, but occasionally with spondylotomy, aiming at forced evolution.
3. Spondylotomy at the neck or the centre of the body, aiming at the successive extraction of the fœtus in portions.

1. *Method which aims at forced Version.* A. *Robert Lee's Procedure.*—This consists in performing brachiotomy, then perforating the thorax, and by means of a hook inserted into the pelvis or the lower part of the vertebral column, to make traction on the fœtus, and deliver without damage to the maternal parts.

Rejected by Chailly and Cazeaux, brachiotomy has been practised by Dubois as a means to assist in decapitation. Stoltz, Pajot, Depaul, Blot, admit that it is useful, and in certain instances indispensable. By brachiotomy we mean, of course, disarticulation of the shoulder.

B. *Guiseppe Portas's Procedure.*—It consists of two stages: The first is to pass a filet over the arm, and make traction so as to engage the shoulder and the axilla deeply, when perforation is performed by means of a bistoury into the thorax, and thence the abdominal and thoracic viscera are removed; the second is to seek the feet and deliver by podalic version.

2. *Method which aims at forced Evolution.*—There are five procedures.

A. *Veit's Procedure.*—The fœtus is eviscerated, without brachiotomy, traction is made on the arm and the breech simultaneously, and the infant extracted doubled on itself.

B. *Michaelis's Procedure.*—Evisceration, followed by spondylotomy and forced evolution of the fœtus.

C. *Macdonald's Procedure.*—Spondylotomy without evisceration, extraction of the fœtus by the feet—in other words, delivery by forced version.

D. *Boens's Procedure.*—Removal of procident portions, that is to say, brachiotomy, thoracic and abdominal evisceration, crushing of the thorax by the fingers. Finally, section of the fœtus in two, followed by separate extraction.

E. *Championnière's Procedure.*—Evisceration; spondylotomy by a screw rod; at times brachiotomy; removal of the fœtus in two portions. Results; 3 operations with two deaths.

3. *Method which aims at successive Extraction of Portions of the Fœtus.*—Section of the fœtus may be practised on the neck or on the trunk. In the first instance we are dealing with decapitation, method of Celsus.

The instruments with which decollation may be performed are ranged as follows by Thomas: *a.* Knife embryotomes. *b.* Scissor embryotomes. *c.* Saw embryotomes. *d.* Embryotomes which act by pressure and laceration.

a. *Knife Embryotomes.*—In this category belong the bistouries of Steinen and of Busch, the knives of Albucasis, Paré, Rizzoli, Mauriceau, Ramsbotham, Jacquemier, the crochet of Simpson, the decapitator of Scanzoni, etc. In general, these instruments are defective, and by no means as valuable as the scissors.

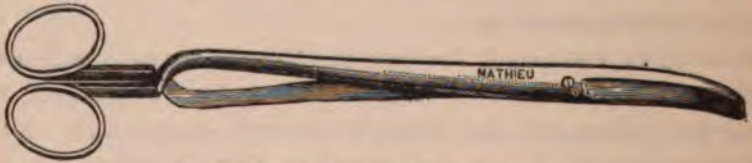


FIG. 171.—DUBOIS' SCISSORS FOR DECOLLATION

b. *Scissor Embryotomes.*—The best instrument is that of Dubois. It consists of long handles, very strong, short blades slightly curved on the flat, with blunt ends. (Fig. 171.) In using them, having carefully determined the presentation, Dubois inserts the left hand into the vagina, and guides along the fingers a blunt hook which he endeavors to pass around the fœtal neck. When successful, he withdraws the hand, and grasping the handle of the hook he makes strong traction to bring down the fœtal neck. He then hands the hook to an assistant, inserts his hand again into the vagina, and places the end of his finger at the point where he intends to cut the neck. He passes the scissors along this finger up to the fœtus, and cuts the integuments little by little, separating the blades only slightly, in order not to damage the maternal parts. During this procedure the finger which surrounds the neck must never leave it, but must take account of the progress of the section.

Mattei uses strong scissors which he calls *endotomes;* Lazarewitch uses an instrument which is at once a sector and a tractor. Tarnier contends that the scissors attack with difficulty the soft parts, and all the more the bone. Never, however, have we seen the operation last longer than ten minutes when performed by Depaul, and never, except in one case, has it required longer in our personal experience. The difficulty is not in the cutting, but in the passage of the hook around the neck. Where the neck is accessible, we believe the method to be the best. Where the neck is not accessible, we must eviscerate.

c. *Saw Embryotomes.*—Here belong Jacquemier's embryotome (Fig. 172,) Van der Ecken's crochet (Fig. 174), the crochets of Kilian, Mathieu, Heyerdahl, Kierulf, Hohl, Wasseige (Fig. 173), Stanesco (Fig. 175), Tarnier (Fig. 176), etc. All these crochets are intended to carry behind the neck or behind the trunk of the fœtus, a saw or écraseur, in order thus to break up the infant.

Of all these instruments the simplest is that of Pajot. With a stout piece of silk or twine the fœtus may be sectioned in a minute, the twine being worked backward and forward, and without risk to the mother. The twine may usually be passed around the fœtus by means of a blunt hook, and I have had a hole drilled in the blunt crochet of the forceps which receives the twine, and to the twine may be attached a small leaden weight, which assists the accoucheur in reaching the end which has been passed around. Tarnier has suggested Belloc's sound for the passage of the twine. [A gum-elastic catheter, the uterine sound, instruments which are apt to be in every accoucheur's bag, are as serviceable as anything else.—Ed.] When the twine has been passed, the hook is withdrawn, the ends of the twine brought out through a cylindrical speculum, which is inserted to protect the vagina, and then by to-and-fro movements the operator may readily saw the neck, or the trunk. This method was

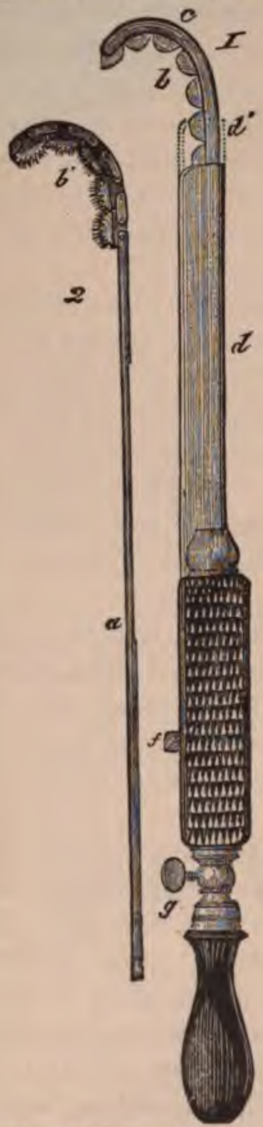


FIG 172.—JACQUEMIER'S EMBRYOTOME.

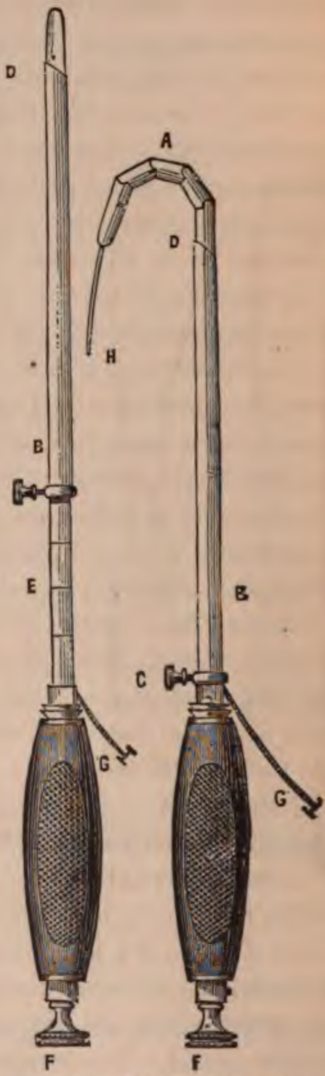


FIG. 173.—WASSEIGE'S CROCHET.

first advocated by Boyer, and has been successfully used by Pajot, Tarnier Rey, and others.

The crochets of Kidd, of Tarnier, of Hubert, of Wasseige, of Stanesco, are certain ones articulated, and others not.

d. *Embryotomes which act by pressure or laceration.*—The simplest of all is Braün's blunt hook. It is composed of a steel bar bent at an acute angle in the shape of a crook. (Fig. 177.) The fœtal arm is pulled down as much as possible in order to make the neck accessible. The left hand is introduced into the vagina and one or two fingers are passed around the neck. The hook is then passed flat along the hand and behind the fœtal neck, guided by the fingers. The handle of the instrument is then lifted up, and vigorous traction made horizontally until the ligaments of the vertebral column are heard to rupture. The hook is then turned

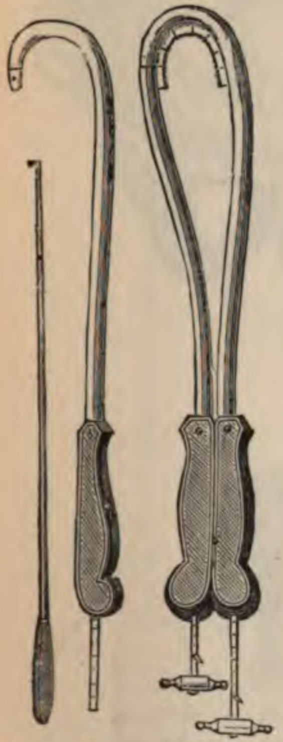


Fig. 174—Van der Ecken's Crochet for Decapitation.

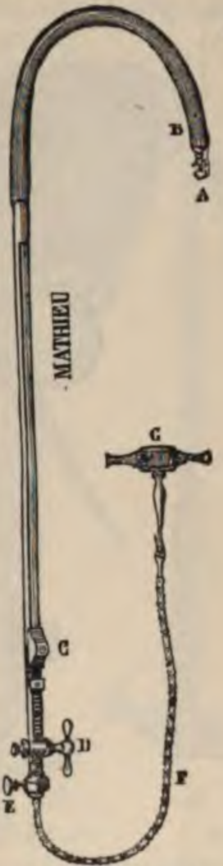


Fig. 175.—Stanesco's Crochet.

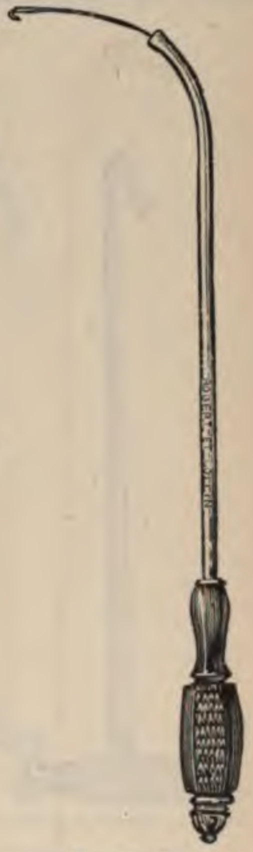


Fig. 176.—Tarnier's Crochet.

around several times, traction being simultaneously made. The vertebral column and the tissues are thus torn. The fingers should not be withdrawn during this manœuvre, since they are there to protect the maternal parts against injury. The fœtal trunk is readily extracted by pulling on the arm, and the head may be removed either by the hand, the forceps or the cephalotribe. (Fig. 178.)

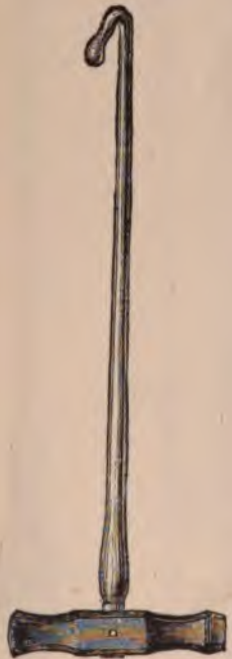


FIG. 177.—BRAUN'S BLUNT HOOK.

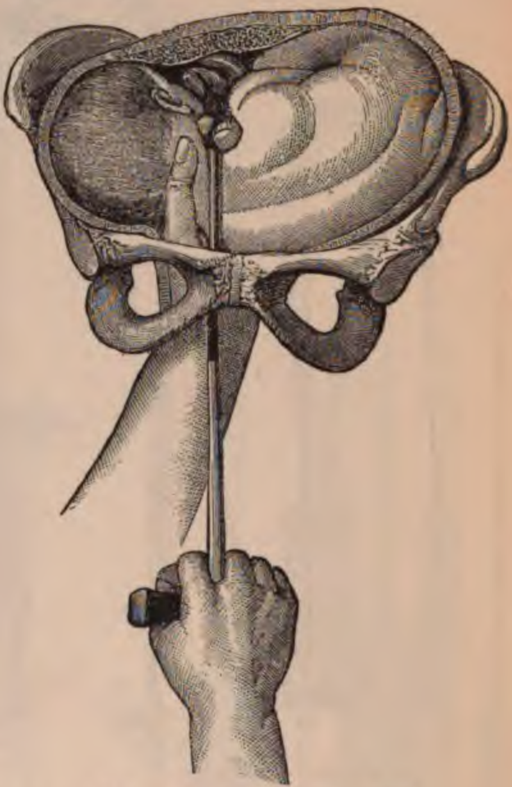


FIG. 178.—DECAPITATION AFTER BRAUN.

Pierre Thomas has devised an apparatus which consists in: 1. Braün's hook. 2. A chain-saw. 3. A vaginal protector.

Braün's hook is perforated for the passage of the chain-saw, and is used for passing the chain around the fœtal neck. This accomplished, the hook is withdrawn, and the two ends of the chain passed through the tubes of the vaginal protector (Fig. 179, B), and the neck is sectioned by working the chain. Thomas says of his method: "We believe that it has the following advantages over Braün's: 1. The maternal parts cannot be injured either by the hook or the chain. 2. The operation is less painful and is more certain and rapid." We have already stated that Barnes carries an écraseur wire by means of Ramsbotham's hook, in order to perform brachiotomy.

The two most recent embryotomes are that of Tarnier and that of Thomas, which is simply a modification of Tarnier's.

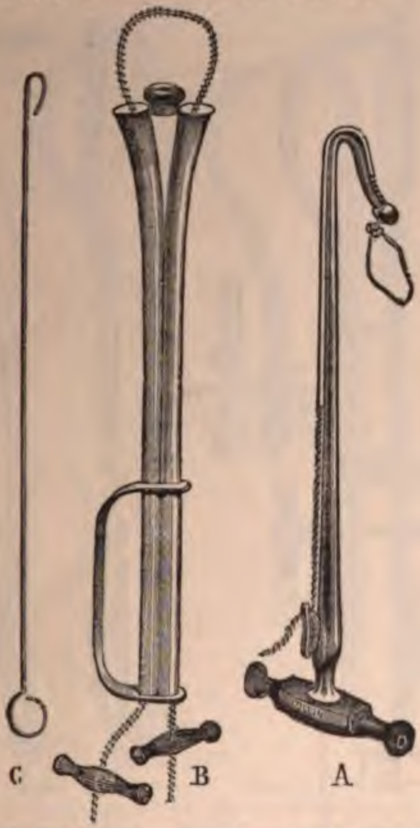


FIG. 179.—PIERRE THOMAS' INSTRUMENTS FOR DECAPITATION.

Tarnier's embryotome is composed of two blades, two conducting rods, a chain-saw. One blade is called the posterior and the other the anterior. These blades are grooved. The posterior blade is curved to fit into the concavity of the sacrum. The anterior blade is slightly curved for insertion between the fœtus and the pubes. The blades are applied around the fœtus, and are locked and screwed down until the handles are close together. The chain is then pushed through the groove in the blades by means of the conducting rods, and worked along as well by the screw key. The fœtus is divided from below upwards. The entire thickness of the body may be cut through in five seconds, according to Tarnier.

Thomas's latest embryotome consists of two blades, two stylets, a special saw. (Fig. 181.) The instrument is used as follows: The posterior blade is inserted behind the neck or the trunk of the fœtus, and the anterior blade in front. The blades are locked and brought in apposition. The chain-saw is then carried by the stylets through the blades. The instrument is steadied by an assistant, and by rapid to-and-fro movements of the chain the fœtus is sectioned from below downward. The maternal parts run no risk of being damaged by the saw, being protected by the blades of the instrument.

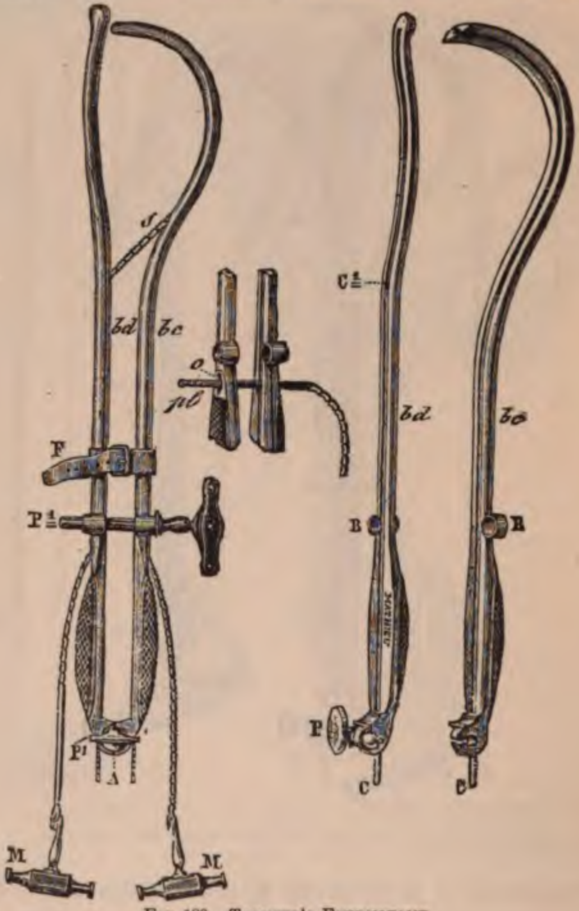


FIG. 180.—TARNIER'S EMBRYOTOME.

We see then that it is not instruments which are lacking. The real difficulty in embryotomy is the contraction of the uterus. Where then the blunt hook cannot pass, the same will hold true of other instruments. The simplest method is that of Braün, but it requires an amount of force which may be dangerous to the mother. The same does not hold true of Dubois's scissors. We should then prefer them, resorting to Pajot's device if they failed. In every case where we have been called upon to detruncate or eviscerate, Dubois's scissors have answered us well. We have had six successes in seven cases.

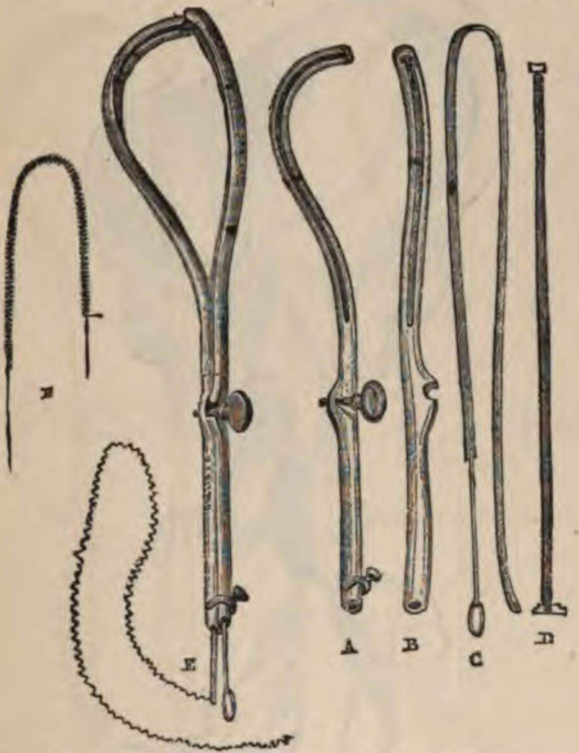


FIG. 181.—PIERRE THOMAS' EMBRYOTOME.—*A*, Posterior blade. The exaggerated curve of the uterine portion is shown, also the groove for the passage of the chain saw. *B*, The anterior blade is slightly curved at its uterine part. *C*, *D*, Stylets. *E*, Instrument articulated. The conducting stylet is inserted. *F*, Chain saw.

After decapitation the body of the fœtus readily follows on traction on the arm. The head may give us trouble. In case it resists our gentle efforts with the hand, forceps or cephalotribe, we may try a blunt hook inserted into the mouth.

Embryotomy is always a grave operation. The mortality rate is, therefore, high, even where practised with the greatest possible care and expertness.

Such are the operations which may be practised on the fœtus. May they be compared one with another, from the standpoint of the results which they give for the mother and the infant? We do not think so; the conditions vary too markedly according to the case, the mode of intervention and the necessity. The statistics which we have given, it should be remembered, have been copied and recopied, and they vary much according to each author. There is further the element of expertness, which we must take into account, and which explains fully the success of some where others have failed.

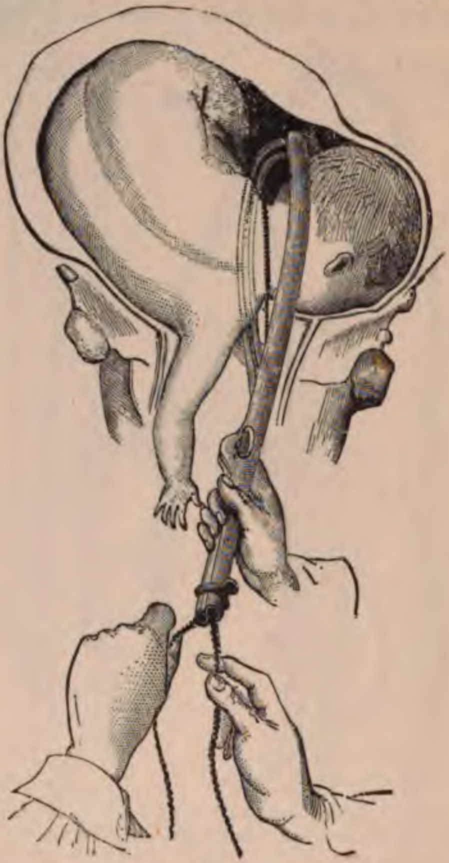


FIG. 182.—EMBRYOTOME AROUND THE NECK OF THE FŒTUS, HELD BY AN ASSISTANT.

PART VIII.

The Pathology of the Puerperium.

CHAPTER I.

THE PATHOGENY OF PUERPERAL FEVER.

ALTHOUGH under the term pathology of the puerperium, we might include all the morbid manifestations which may occur during, and disturb the course of the physiological puerperal state, a detailed study of these manifestations would carry us far beyond the limits of this work, and require volumes. We will limit ourselves, therefore, to a sketch of what was formerly called puerperal fever, but what tends more and more daily, to be known as puerperal septicæmia. Although, however, we think that puerperal fever, as an essential morbid entity, should be rejected, we believe that Luys and Siredey have gone too far in wishing to banish it altogether. Among the diseases which may affect the puerperal woman, there are some which are purely inflammatory, and there are others, unfortunately the vast majority, which depend on a true poisoning, which are due, in other words, to the absorption by the puerpera of septic germs, products of decomposition, the name matters not, and these we may range under the term puerperal fever, puerperal septicæmia. Such are the accidents to which the older writers gave the name puerperal fever, and to entirely reject this term is to enter the road which leads directly to the localization of puerperal affections. Certainly all women affected with puerperal fever do not present the same lesions. At times we have a phlebitis, and again a lymphangitis, or a peritonitis, or even a pleurisy, as the principal lesion, but each of these is simply a peculiar manifestation of a general state, and it is this general state which constituted for the ancient writers puerperal fever, and which is to-day known under the name of puerperal septicæmia. In a word, there is infection of the patient. One or the other term, hence, is with us interchangeable.

Puerperal fever, puerperal septicæmia, may be endemic or epidemic. Even as the symptoms of the affection may vary infinitely, however, so too may the epidemics in their severity. Since the first epidemic at the Hotel-Dieu, recorded by Mauriceau and Lamotte, 1664, scarcely a year has passed without our being able to refer to an epidemic at one or another place in the different parts of the world.

While all authorities agree in regard to the application of the term puerperal fever, the theories of its origin have been innumerable, and even to-day there are questions concerning it which it remains for the future to decide.

The earliest theory was based on the idea of retention of the lochia, and decomposition of remnants of the placenta. This theory originated with Hippocrates, and was defended by Galen, Avicenne (1000), Rhodion (1532), Mercatus (1570), Victor Trincavellus (1597), Roderic de Castro (1603), Michaelis (1615), Boerhaave (1629), Sennert (1631), Sydenham (1682), Stahl (1690), Hüter (1711), Mauriceau (1712), Burton (1751), Smellie (1752), Astruc, Johnston (1769), Tissot (1795), and many others. The lochia being checked by inflammation, or by spasm of the vessels, septic materials were retained in the blood. The uterus and other organs became diseased, and there finally resulted putrid fever.

To this theory succeeded that of the metastasis of the milk, which was first promulgated by Mercurialis and Willis, in 1662, and was advocated, in particular, by Puzos, (1743), and later by Lieutaud (1750), Sauvages (1640), Levret (1766), Van Swieten, Deleurye (1777), Baldinger, Leroy, Plenck, Henkel, Boer, Fischer, Hecker, Wenzel, E. Martin, Broussais, etc.

At the beginning of this century, Autenreith formulated his physiological theory, which is purely a combination of the preceding. During pregnancy excretions flow specially towards the uterus, but after labor they are eliminated by the sweat glands, the lochia and the milk. If these peripheral functions are interfered with, the course of these excretions is turned towards the head, the thorax, and above all the abdomen. This theory was accepted and sustained by Schmidtmüller, Carus, Joerg, d'Outrepont, etc.

Then arose the gastro-bilious theory of Trincavellus, which was advocated in particular in England by Manning, Cooper, Denman, and others.

The fifth theory is the phlogistic; according to which inflammation is the cause of puerperal fever. According to the site of the inflammatory process, we may have three varieties:

1. A metritis, the opinion of Plater, 1602, Denman, Tissot, Naegelé, and others, and this metritis may be associated with a phlebitis or a lymphangitis.

2. An enteritis and a peritonitis.

3. Peritonitis, pure, the view held by Johnston, Hunter, Siebold, Capuron, Baudelocque, and others.

Then followed the erysipelatous theory, which was advocated in particular by Eisenmann, and accepted by Delaroche, Bayrhoffer, Gordon, Ingleby, Lee, many American and English authorities. This theory considers puerperal fever an internal erysipelas.

The discussion on puerperal fever at the *Académie de Médicine*, in 1858, resulted in a division of authorities into two categories, the localists and the essentialists.

The localists, represented by Boullaud, Cruveilhier, Cazeaux, Jacquemier, Velpeau, Piorry, Beau, claimed that the local lesion constituted the disease, and they eventually all, with the exception of Beau, finished, under the influence of Trousseau, by claiming that puerperal fever had its origin in lesions of the genital tract, which were complicated by general secondary lesions, the outcome of purulent infection.

The essentialists, under the leadership of Paul Dubois and Depaul, claimed that "puerperal fever was due to a primitive external influence, at first acting on the blood and then attacking the organism at points of predisposition, such as the genital system, the peritoneum, but essentially leading to general poisoning by morbid reaction on the blood, and the organs in general. The contagious nature of the disease was granted in full by them." (Doleris.)

The idea, hence, of a miasm, of a poison, of a transmissible virus, was thus definitively established, and was later advocated by Hervieux. This idea had already been broached by Whyte, in 1770, who, from the fact that puerperal affections showed themselves in particular in maternity hospitals, claimed that septic matters either developed spontaneously in the organism or were introduced through the atmosphere tainted by putrid elements. Walsh, in 1788, reported the case of a puerpera poisoned by putrid fever; Douglas described an epidemic or contagious form; Cruveilhier accepted the doctrine of hospital miasm, and the poisoning of the puerpera through the uterine wound, and he was followed by Eisenmann and Helm, who declared that the uterine wound might be contaminated by miasmatic influences acting directly, or else penetrating into the circulation by the respiratory tract, and finding in the irritated and the wounded uterus a point of receptivity. Finally, Kiwisch, Litzmann, Scanzoni, Bamberger, Veit, claimed that the poison acted directly on the blood, and this is the theory of Dubois and of Depaul.

Scanzoni and Ferguson endeavored to detect the nature of the blood change, and found, successively, hyperinosis, pyemia, dissolution of the blood. In 1847 to 1861, Semmelweiss promulgated the following theory: Puerperal fever must always be considered as a fever due to the absorption of a decomposed animal organic matter, and this absorption may result from *auto-infection* (the product of decomposition coming from the individual itself), or from *hetero-infection* (the product of decomposition coming from without). Consequently, not only the cadavers of every age, and of every sex, when they are in a state of decomposition, but also the sick of every age, and of every sex, whose disease is accompanied by decomposition of organic animal matter, and furthermore every animal organic tissue, which presents a certain degree of decomposition, every one of these may be the starting-point of puerperal fever.

Puerperal fever is not, therefore, a peculiar and exclusive disease of the puerpera. An identical affection, even as has been proved by Trousseau, Schée, Helm, Buhl, Simpson, Tarnier, may be met with in virgins, in the new-born, in wounded of either sex. The point of origin of the disease is found as well in the uterine wound, and in slight superficial wounds of the genital organs, as in lesions of the peri-uterine cellular tissue, or in the vagina. The primitive local disease becomes general through the carrying of the morbid process to the cellular tissue, thus gaining in extent, or else it is transported by the lymph or the blood to all the other organs; or else foreign bodies are carried by the circulation, deposited in different organs, and there become the source of the disease. The causes of isolated cases, that is to say, of those developing aside from all epidemic influences, are: 1. Lesions and wounds of the genital organs. 2. Retention followed by alteration of portions of the placenta or of the membranes. 3. Primitive inflammations of the vagina and of the womb, such as those caused by gonorrhœa. 4. Finally, infection of wounds of the genital organs by cadaveric emanations, purulent or gangrenous secretions, etc.

Schroeder, who is a resolute advocate of the theory of Semmelweiss, thus expresses himself: "In order to understand distinctly the manner after which infection occurs in the puerpera, it must be compared with one of the frequent varieties of infection which occurs in other parts of the body.

When, at an autopsy, infectious materials from the cadaver come in contact with a slight abrasion on the finger, we witness, according to the amount absorbed, and especially according to the individual predisposition, different phenomena. Either the point of contact alone is affected, so that there results suppuration of long duration; or else the inflammation extends to neighboring parts, and there result inflammatory affections of the lymphatic vessels of the arm, and an abscess in the subcutaneous cellular tissue, as well as in that between the muscles. The entire system is not otherwise affected than it is in case of other local inflammatory affections—that is to say, the individual has only a moderate fever. Similarly, in a puerpera, as the result of infection of an abrasion on the vulva, there may arise an ulceration which heals quickly, or else an inflammation, which, following the course of the lymphatic vessels and the cellular tissue, may extend much further and eventuate in a suppurative lymphangitis and an exudation around the uterus and the vagina. The entire organism is not much more affected than in case of other local inflammatory diseases, and the fever is identical with that which accompanies such affections. If, however, the infection of the finger by the cadaveric poison is more intense, then, at the end of twenty-four or of thirty-six hours, we see serious general phenomena develop. These are characterized above all by elevation of temperature entirely out of proportion to the local affection, a fever which imperils to a high degree the functions of the entire organism. Death may occur with lightning-like rapidity, and *post-mortem*, aside from slight alterations in the blood, we may find no changes visible to the naked eye. The individual has succumbed to *septicæmia*.

In other instances we find acute degeneration of the large abdominal glands and of certain portions of the voluntary muscles, or else pleuropneumonia, peritonitis, arthritis. The individual has succumbed to *ichoremia*.

In other instances, finally, there are thrombi in the veins near the wound. These thrombi are decomposed, and small portions are carried by the vessels and deposited usually in the lungs, and then give rise to infarctions and to abscesses. The individual has succumbed to *pyemia*.

In an exactly similar way, when infection occurs in the puerpera, are the local affections thrown into the background. At the end of thirty-six hours, the temperature rises to a high degree, with or without a chill, and the same fever affects her as we have seen may affect the individual suffering from cadaveric poison. The parallel need be carried no further, since the same phenomena occur here step by step, even as we have just described them.

Further still, even in case of simple wounds, the entire system may be touched, and this is what is called traumatic fever. But although the ordinary traumatic fever is evidently the result of decomposition of the inflammatory products within the tissues, products which are carried in the circulation, and which consequently give rise to what may be termed a fever from absorption; and although this fever scarcely presents what may be termed specific characters, by which it may be distinguished from that due to infection, the essential characteristic of non-infected wounds is precisely their local nature, that is to say, the inflammatory process does not extend beyond the tissues which limit it; it remains circumscribed, and the fever, even though it presents differences in intensity according to the individual, never exceeds the degree which it usually attains in local inflammatory affections. If, on the other hand, the wounded surface is infected, either by auto-infection or by hetero-infection, the inflammatory process may still remain local, since the infectious materials are isolated from the remainder of the organism, owing to the transformation of the wound into an abscess incapable of resorption; but if this salutary abscess, so to speak, does not form, or not in time, the inflammation may spread to the neighboring tissues. If it extends superficially along the skin or the mucous membrane, it manifests itself as an erysipelas. In other instances it penetrates more deeply, by following the connective tissue, and we may have an abscess. The entire organism may, in these cases, present nearly identical phenomena to those which accompany local inflammatory processes, but very frequently the temperature rises higher, the pulse becomes much more frequent than one would expect in case of a purely local affair, and this is proof that the excretions from the infected site have reached the blood. Again, when the fever is moderate, we may always doubt if the entire organism is not affected by septicæmia, or ichorremia, as the result of the nutritive inflammatory troubles which are present in all the organs.

What, therefore, we must consider as peculiarly characteristic and dangerous in infected wounds, is the great tendency of the inflammation to extend by continuity to other parts. In the puerpera, the state of the cellular tissue around the uterus is an indication as to whether the inflammation of the vulva or cervix is local or progressive. Exudation in this tissue, in our experience, always depends on infection of the puerpera, or the non-puerpera. If, during delivery, there occurs a tear of the upper part of the vagina, when there is no infection, it is always the parts immediately in contact with the borders of the wound which inflame. The sides of the uterus are neither tumefied nor sensitive, while, even in case of simple erosion of the vaginal mucous membrane, if there be infection, we may usually determine the fact that the inflammatory process has spread into the cellular tissue which exists to the sides of the uterus."

If we have thus detailed Schroeder's views, it is because they represent absolutely our own, and because with him we grant in puerperal diseases only two varieties. Every labor, however normal, is necessarily accompanied by erosions, wounds, fissures, of the vulvo-vaginal mucous membrane and of that of the uterus, possibly deep lesions to the side of the cervix and the uterus. Finally, the placental site, with its thrombosed vessels, represents itself a vast wound. If these wounds remain simple, there arise no symptoms, or else these remain purely local; but if the wounds are infected, there result poisoning of the woman, and that entire series of phenomena to which the name of puerperal fever has been and is still given.

We would, however, go still further than Schroeder, and maintain that even these wounds and abrasions are not indispensable for infection. Do we not indeed often see true phenomena of poisoning appear in physicians who are frequently brought in contact with cadavers, or are busied with the preparation of anatomical specimens? Here the infection unquestionably occurs through the respiratory and digestive tracts. There is true septicæmia, and the same holds true, we believe, during the puerperium. The wound is not necessary, but only the presence of the infecting agent. We will see shortly what the nature of this agent is.

Doléris thus expresses himself: "To-day all authorities are in accord in considering puerperal fever as a species of poisoning. The most resolute localists have long since renounced the view that the disease resides in the lesion itself. This lesion is, according to them, purely a necessary phenomenon, necessary when it is primitive, as the uterine wound, and gives access to the poison or furnishes a site for its development; necessary, again, when it is secondary even as are organic metastases, which are only a result of the introduction of the poison into the economy; necessary, further still, when it is intermediate, so to speak, as is phlebitis, lymphangitis, which are only the traces of the passage of the toxic element, the septic element, whatever it be, and which serve as entrance-gates into the organism. The question, therefore, for them is limited to the infection of the wound. The *sine qua non* condition of toxemia is a raw surface, a surgical wound. *No wound, no infection.* Both phlebitis and lymphangitis, in surgery as well as in obstetrics, exist from the same causes. Lesions of the uterine lymphatics are in intimate connection with lesions of the neighboring serous membrane and the glands, even as the septic wound, however slight it be, is in absolute connection with the lymphangitis, the erysipelas, the diffuse phlegmon, which are often the consequences. Phlebitis introduces into the blood morbid elements, which carry further on the germs of what are known as metastatic affections, and which, customarily, are found in the viscera. Such is the case both in puerperal metritis and in the surgical wound."

The recent investigations of Lucas Championnière, Siredey, Quinquaud, Fiouppe, Despine, Bodé, plead in favor of the absolute similarity of puerperal and of surgical infection. This is the doctrine uniformly admitted in France, and the one stated by Winckel in 1878. It is the doctrine admitted almost uniformly throughout the world.

[In the United States, the belief of almost all accoucheurs is certainly in accord with the statements made by Charpentier. Puerperal fever is septicæmia, differing only from surgical septicæmia in that, superadded to infection, is the puerperal state. The most distinguished exception is Fordyce Barker. He still clings tenaciously to the views promulgated by him years ago, and with an ardor which, if it does not carry complete conviction, certainly tends to make every thoughtful man hesitate a trifle in propounding the absolute statement that puerperal fever is *always* simply puerperal septicæmia. In the memorable discussion before the New York Academy of Medicine, in 1884, when Thomas, with all his eloquence, plead for the entire identity of this fever with septicæmia, Barker alone protested against such a broad view, and stated that "his creed today is fully avowed in his book on the Puerperal Diseases, and unless in the future he learned new facts and new arguments to change his faith, he should die impenitent." In reference to Thomas's argument, he stated that its pathological doctrines were misleading and dangerous, because they were "supersaturated with septic infection." Barker's creed to-day, even as yesterday, is that there does exist an epidemic disease differing in all characteristic points from what is known as septicæmia; differing in its origin, its modes of attack, its symptoms, its anatomical lesions. These symptoms are frequently manifested a day or two before, or even during labor, even when the child is subsequently born alive. In septicæmia, the symptoms are never observed before or during labor, except when the fœtus is putrid. The former disease, puerperal fever, originates from epidemic causes, and from contagion and infection; the latter from nosocomial malaria, from autogenetic infection, and from direct inoculation. Barker's conviction, therefore, is still that there is such a disease as puerperal fever *sui generis*, and that outside of hospitals less than two per cent. of the puerperal diseases, and not half of one per cent. of the deaths after child-birth, are due to septicæmia.

Such then is Barker's standpoint to-day, and he holds this position firmly in face of the almost uniform belief of obstetricians throughout the world that, as Lusk expresses it, surgical fever and puerperal fever are not only analogous, but are essentially one and the same process. Of all those who discussed Thomas's paper, Lusk, Chamberlain, Hanks and others, only one, Mundé, was inclined to agree in a measure with Barker. Mundé's views are best expressed in a quotation from his recently published appendix to Cazeaux and Tarnier's Treatise on Obstetrics: "I believe the majority of cases of so-called puerperal fever to be, in reality, cases of puerperal septicæmia, the septic infection coming usually from without, carried generally by the fingers, instruments, dressing, etc., and no doubt at times in the clothing or on the person of the attendant, but in exceptional cases transmitted through the medium of the atmosphere. I am impelled to the last admission by the fact that I have seen apparently spontaneous cases of puerperal fever, in which all possibility of infection by contact could be absolutely excluded. I have been unable to explain the occurrence of such cases except by transmission through the air by a so-called *status epidemicus* (I refer, of course, to cases in private practice), unless I join the small minority of obstetricians, at the head of whom, in this country, stands Fordyce Barker, who still firmly believe in the occurrence of puerperal fever as a zymotic disease *sui generis*, that is, a disease produced by a specific poison of its own. I must confess that I have not been able to entirely divest myself of the belief that such a disease *may* exist, though I also believe that it is one of the rarest of exceptions."

For our part, we are unwilling to commit ourselves to the absolute statement that we are ever dealing with septicæmia, pure and simple, exactly like unto surgical septicæmia. Every age has its craze, and this is essentially the age of microbes and of sepsis. The question, judicially considered, must still be left open. We have certainly seen cases where there was absolute certainty, as far as this can exist at all, of the absence of any and all possible causes of infection, and yet the patients have suffered from puerperal fever, a fever zymotic, essential. The future, we think, will testify to the truth of Barker's views in very exceptional instances, that is to say, while septicæmia will be the disease in nine hundred and ninety-nine cases, in the thousandth the disease will be of zymotic origin. The one, in the future, will be absolutely preventable, the other no more so than are the other so-called essential fevers.—Ed.]

Max Boer, in his report at Berlin, 1877, declares in the name of the appointed committee, that puerperal accidents are due to the absorption by the lymphatics, and by the blood-vessels of septic materials engendered in the uterus by putrid decomposition, and Boer's conclusions are accepted by Schroeder, Fasbender, Martin, Löhlein, Winckel and Spiegelberg.

In America, in Belgium, in Italy, Denmark, Switzerland, England, the same unanimity exists, and Johnston, Atthill, MacClintock, Macan, Priestley, admit that puerperal fever is only septicæmia the result of ichorremia. According to Playfair there exists identity between puerperal septicæmia and surgical septicæmia, and there may be either *auto-* or *hetero*-infection; auto-infection resulting from any condition which causes decomposition, whether of the maternal organs themselves, or of *débris* retained in the uterus or the vagina, or of putrefied portions of a dead fœtus; hetero-infection, resulting from cadaveric poison, erysipelas, zymotic diseases, puerperal contagion through physician, nurse, or others.

[Robert Barnes, in discussing the question as to the absolute identity of puerperal fever and so-called surgical fever thus expresses himself: "That there are many points of analogy is undoubted; but there are also points of difference which forbid us to accept the doctrine of identity. The subject of an amputation, and a woman after labor, both present wounds. Both may be considered as susceptible to invasion by poisons.

In both the poison may affect a lodgment on the wounds. But it is easy to carry the comparison too far. Amputation is presumably performed on account of disease. The condition of the patient is pathological to start with. There is no special provision in the system made for the express purpose of healing the wound. The wounds in the puerpera are physiological. There is a distinct provision *ad hoc* for restoration to the ordinary state. It is in this provision, marked by extraordinary activity of absorption and excretion, that lies the peculiarity of the puerperal state. This condition has no parallel in the ordinary surgical patient. If we are asked, What is puerperal fever? may it not be asked in return, What is surgical fever? Is surgical fever one uniform, definite, pathological entity? In neither case is the fever one constant thing. There are varieties of surgical fevers, even as there are varieties of puerperal fevers. If it be contended that by surgical fever is meant septicæmia, and nothing else, this is simply begging the question; we must still ask, What is septicæmia? And again, if surgeons are prepared to give a precise definition of septicæmia in surgical patients, are they also prepared to show that septicæmia of the same character is produced in lying-in women? Septicæmia is a compound term. There is the sepsis, the poison; there is the blood which receives the poison. Now, if it be possible to show that the sepsis in the two subjects is identical, it would still be necessary to show identity or near similarity in the recipient blood. The first term of the proposition is certainly not proved; the second is certainly not true. This theory, then, like that of the microbists, is too absolute and exclusive. It may account for a large number, perhaps the greater number, of cases in lying-in hospitals; but it does not account for cases beginning before there is a wound, nor for the propagation to non-puerperal women." Barnes, further, is inclined to grant that a fever may attack the puerpera of zymotic origin, to which the specific term puerperal fever may be applied. These words, from one of the leading accoucheurs of the world, may well be pondered by those who, carried away by the prevalent doctrines of sepsis and of microbes, can see nothing outside of them.

Alfred Galabin, in his recent work on obstetrics, resumes the question of puerperal septicæmia and of puerperal fever, *sui generis*, as follows: The chief arguments showing that puerperal fever is not a specific zymotic disease are: 1. The symptoms and anatomical lesions of the disease have not a special and definite character like those of a specific zymotic disease, but are rather analogous to those of septicæmia or of pyemia following surgical wounds. 2. A definite local cause, such as decomposition of retained placenta, may give rise to a disease undistinguishable from puerperal fever due to conveyed contagion, and having the same anatomical lesions. 3. Puerperal fever may be originated not merely by contagion conveyed from other puerperal women, but by various kinds of septic material.

The same gentleman thus resumes the evidence for the belief that a disease in a puerperal woman, not having the characteristic symptoms of a zymotic disease, but resembling puerperal septicæmia, may really be of zymotic origin: 1. Even apart from the puerperal state, cases of zymotic disease occur in which the rash or other characteristic signs are not developed. 2. In undoubted cases both of puerperal scarlatina and puerperal erysipelas, symptoms of inflammation of the peritoneum and in the pelvis are common. 3. Undoubted scarlet fever is so modified in puerperal women, that while the mortality is very high, the sore throat is almost always slight. 4. Cases of puerperal pyrexia occur, often severe or fatal, in which sore throat is absent or very slight, and the rash so little defined that it is difficult to decide as to whether the disease should be reckoned as scarlatina or not. In these cases symptoms of inflammation of the peritoneum and in the pelvis are often marked. "There is strong evidence that a disease which cannot be distinguished from other forms of puerperal fever, may be originated by the conveyance of contagion from certain zymotic diseases, especially erysipelas and scarlet fever. Accordingly the view is accepted by many, probably the majority of accoucheurs in this country (England) that these diseases may give rise to puerperal fever."

Gallabin, thus, must be ranked with those who claim that, although rare, a puerperal fever, *sui generis*, may exist.—Ed.]

As we have seen, almost all authorities admit the necessity of a wound, and Hervieux and Depaul are about alone in the claim that there is something else than a septicæmia of local origin in puerperal affections, thus championing the doctrine of essentiality.

We think that there is exaggeration in both these beliefs. Certainly, in the vast majority of cases, there is a wound, and by wound we understand not only the uterine, but fissures, vulvar and vaginal erosions, tears of the cervix caused by the fœtal head; and here it is that, ordinarily, infection occurs. But this wound, these fissures, are not for us indispensable, and from this standpoint we agree with Hervieux and Depaul. Puerperal fever is the result of infection; it is contagious to the highest degree, but, according to our belief, no wound is necessary, and we claim that infection, aside from any local lesion, may take place through the respiratory tract, or the digestive, the patient thus infected being able to transmit the contagion to other puerpera. This contagion of puerperal fever is to-day no longer contested, and it has been proved by numerous researches both in France and abroad. It remains only to find the septic agent, the miasm, the poison, the infectious germ, the indispensable agent. What is it? Whence does it come? Such are the questions which it remains to study, and which have been answered by Pasteur, whose researches have been faithfully stated in Doléris's thesis.

According to Pasteur, this agent is a proto-organism, and this proto-organism is not single, but multiple in variety, giving rise thus to those multiple affections which may be observed in puerperæ.

Mayerhofer first determined, in 1865, that the lochia of infected women were in character putrid, and discovered motile vibrios, which, according to him, were the cause of the putridity. Recklinghausen, and Waldeyer, continuing his researches, proved the presence of these vibrios not only in the lochia, but on the surface of puerperal wounds, in the uterine lymphatics, in the exudations in the cellular tissue, in the serous cavities, and proved also that the fine grain-like masses described by Virchow and Hohl were purely microscopical organisms, *moniliform bacteria*. Despine and Quinquaud, by injecting putrid lochia into animals, produced lesions similar to those of septicæmia.

Orth, in 1873, rejected cylindrical bacteria, which, he claimed, came from the interior, and stated that the puerperal fever germ was a micrococcus, sometimes in isolated globular points, sometimes joined infinitely together so as to form chaplets. Heiberg, 1873, Birsch-Hirschfeld, 1874, Spillmann (Nancy), 1876, Köhrer, 1876, believed both in the vibrios and the bacteria, and Hausmann, (Berlin) 1876, caused septic phenomena by injecting septic material into the vagina and uterus of rabbits, pregnant and not pregnant. In the latter instance, however, infection only occurred in case there existed a lesion of the vagina.

In 1878, Hugh Miller, of Edinburgh, from a series of researches, claimed the presence of bacteria, micrococci and vibrios. Billroth, on the other hand, did not believe in the bacteria. "The etiological connection, he says, between bacteria and septic disease, or putridity of the blood, has not been proved. In the living organism, certain forms of acute inflammation bring to the pus, from the surrounding tissues, materials which modify its chemical composition in such a manner that the microscopical spores may develop in an exuberant way. In addition to the wounds, there must exist certain determinate forms of inflammation of the connective tissue, erysipelas, abscess, pseudo-erysipelas, diphtheria, or else traumatic inflammation must be transformed into these inflammatory affections, in order that the pus may, in turn, alter a little, and the microbe may develop in abundance. It has been indeed determined that the pus corpuscles may change without the presence of any organism, and, on the other hand, these organisms may be carried in bandages, on instruments, the fingers of the accoucheur, and transplanted on the wound. The water with which this wound is washed is of itself sufficient."

It is to Pasteur, 1879 to 1880, that we owe the most valuable researches. Doleris has resumed the experiments of this distinguished teacher, and it is from his monograph that we borrow the following pages:

"Puerperal infection is an infection which borrows nothing at all peculiar from the puerperal state, otherwise than that it is more or less linked with the weakened condition, the result of parturition, thus finding in diminished ability to resist the action of morbid agents a condition favorable for its development.

"Puerperal women are wounded women, and in addition they have been subjected to hemorrhage, shock, weakness following on prolonged labor, and their blood and tissues generally have been peculiarly modified. Here then are a certain number of predisposing causes. Further still, the nature of the wound, its situation, the presence of materials in a state of disintegration or of decomposition, the retention of decidual or placental *débris*, the presence of external wounds, on the vulva, in the vagina, in a position peculiarly favorable for the entrance of germs even before delivery. Such, among others, are additional predisposing causes. We would not thus imply that always, and in every situation, infection proceeds from local lesions of the wound, for this would be to ignore the simplest undoubted pathological principles; but, unquestionably, the cases of infection from the uterus, are the most frequently observed. It is only exceptionally that infection occurs by other routes. The infection is not always of the same nature. Its varieties depend on many conditions, the principal of which are: The degree of resistance of the subject, the care which is taken, therapeutically, to increase the resistance of the subject, and, above all, the nature of the morbid germ. As Pasteur has said, guided by the light of his experiments, the disease is complex, even as are the causes which give it life.

"The one grand fact resulting from all these experiments is *the presence and the action of inferior organisms.* In accord with all other workers in this line of research, I can affirm that the morbid germ of the disease, ever present in the diseased puerpera, is always absent from the healthy puerpera. This germ is a living organism, susceptible of reproduction under well-established conditions, and capable of reproducing nearly identical lesions. The morbid germs differ according to the different forms of the disease, and, more exactly, according to the lesions presented by the patient."

As early as 1863, Chalvet and Réveil, Lemaire, 1867, de Ranse, 1868-1869, Quinquaud, 1872, Perrin, 1876-1877, had proved that the air in hospital wards, in particular lying-in and surgical wards, contained an infinite number of vibrios, bacteria, and micrococci of all sorts, and Pasteur and Bernheim have proved that certain of these germs are anærobic, and others ærobic, and it is well established that, where decomposition is most abundant, where the germs find the greatest amount of material for development, there they will exist in greatest numbers, and that, as has been conclusively proved by Pasteur, the ærobic micobes prepare the soil for the anærobic.

"Now," says Doleris, "we know what an excellent culture medium the blood is for certain germs, with what facility it decomposes under their influence, and acquires those septic properties on which the greater number of data in regard to septicæmia are founded. There is one point which appears to me fully established, and this is that if we do not always meet with microbes in the circulation, it is not always so where there has occurred rupture of a vessel, and consecutive apoplexy into the surrounding tissue, or into an organ. The germs then develop with extraordinary rapidity. It is likely that the active motion of the blood in the vessels during life is the true cause opposed to the development of germs, when they are in moderate quantities, and when they do not possess certain adhesive properties so well-described by Koch, which allows them to group together, to unite the corpuscles, and to obliterate certain capillaries where they may develop at will.

It is allowable to think that each drop of blood, of pus, of milk, of urine, of any fluid, in short, coming from the uterus, a wound, a secretion, etc., may become a veritable nest of vibrios. These conditions are present to the highest degree in surgical wards.

On the other hand, it has been amply proved that the wounds of the genitals following on labor—and we repeat these wounds are inevitable almost during delivery—are the more exposed to the entrance of germs the more they are external. They each furnish plastic fluid, blood, lymph, morphological elements in which the organisms may develop, and they will develop the more rapidly the greater the alkalinity of the fluids. Now alkalinity is the rule during the few days following delivery, and if douches are sufficient to destroy the few germs which may have gained access by the vulva, the same is not true if the douches are not thorough or only practised at long intervals. The germs then may gain access to the uterus, and there multiply at their ease. Indeed, the anærobic germs, finding themselves then not exposed to the air, are among conditions most favorable for development. At the same time, the other organisms, which result from putrefaction, and which can live as well in as out of the air, may also develop in the vagino-uterine passage. Whence the multiplicity of the germs which are found in this canal. But all are not of the same importance, nor do they portend the same danger. Many exist normally in the utero-vaginal secretions, aside from pregnancy and labor. It results, indeed, from the experiments of Hausmann, Miller, Hottenier, that the *Termo*, the common bacteria, the doubly-pointed micrococcus, which Pasteur considers the cause of putrefaction, is almost always found there. The same holds true, however, of this organism as of the others—it is the number which constitutes the danger. Of course the quality has some effect, but we may more readily get rid of very harmful microbes in small quantity than of less harmful in great quantity. Now it is exceptional that the lochia even of healthy women do not contain microbes, but they are of different varieties:

1. One is almost constant, the pyogenic, which Pasteur believes to be a form peculiar to pus. It is composed of two points well distinct, but

united to form couples. It appears in particular about the third or fourth day, and is distinguished by the fact that it is composed of protean granulations, is flat and is automatic in movement. It is displaced inversely to the current of fluid. (Fig. 183.) This is the diplococcus of many writers, who reserve the term monococcus for the isolated living grains. Others call it the micrococcus.

2. The second microbe differs only from the first in volume, being three to four times larger, and also more brilliant. It unites in pairs, in triplets, and does not constitute true chaplets. Doleris believes that it belongs to a very deadly variety. The more abundant it is, the greater the danger of septicæmia. (Fig. 183.)

3. In the first portion of the vaginal canal is found, sometimes from the sixth to the seventh day, a little ærobic vibrio. It is of little importance from a pathological standpoint. (Fig. 184.)

4. Finally, in true septicæmia, the kind which prostrates from the very beginning, there are found no living organisms in the blood until just before death or even after. The variety of organism is multiple, and is formed of long, thin, cylindrical elements, which are movable and burrow into the tissues, the lymphatics, the peritoneum. Only at a late stage do they reach the blood. These bacteria may assume many shapes. (Fig. 185.) The blood containing them is thick, at times black when death has supervened quickly. The blood globules are much altered, deformed, deprived of hæmoglobulin, but the leucocytes are not particularly increased. (Fig. 186.)

In a milder form of septicæmia the blood always contains microbes, and this is in the common suppurative form. The micrococcus in chains is the active organism. (Fig. 186.) But in the phlebitic form, with thrombi, these micrococci in chains are not common. The nature of the organism differs with the case. When the lymphatic lesion coexists and developes progressively, cultivation of the micrococcus of the blood gives rise almost constantly to long chaplets of grains similar to those contained in the lymphatics, and sometimes cylindrical. When the hematic lesion alone exists, culture gives rise only to colonies of micrococci in irregular groups or in couples, but these are never sufficiently organized to form chains.

When the hematic lesion is accompanied by phlebitis and thrombus, the almost constant form is the point in couples. Culture produces it

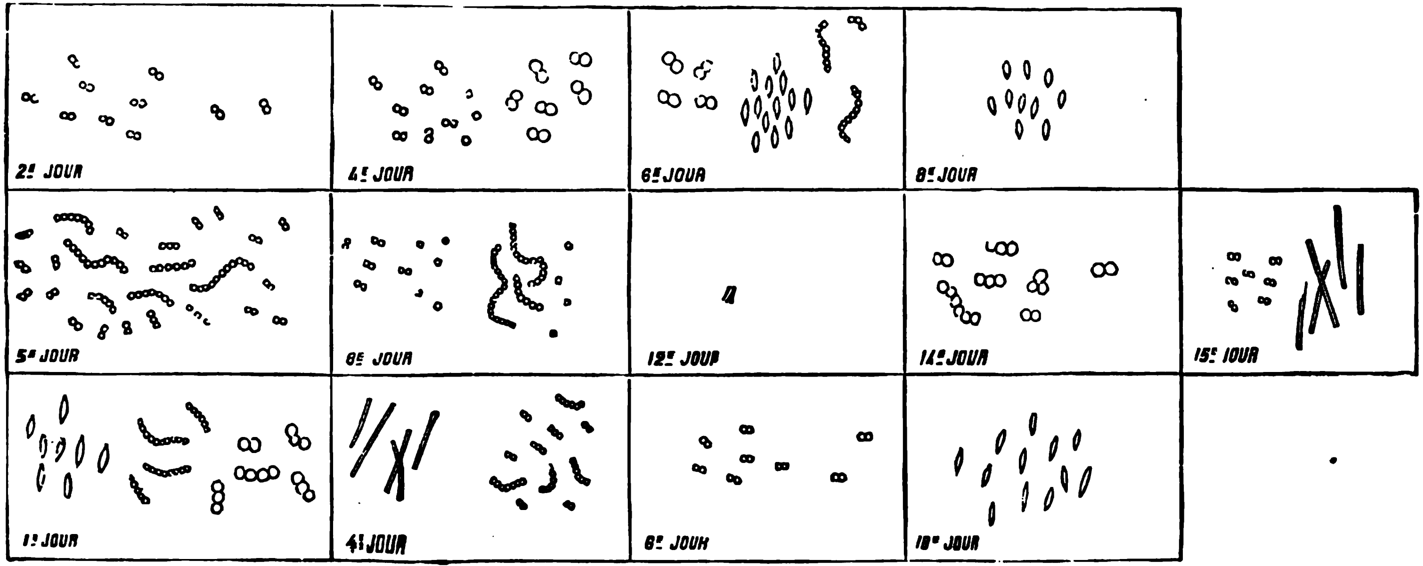


FIG. 183.—Microbes in the lochia of three septic puerperæ. (*Doleris.*) The numbers, 1, 2, 3, etc., represent the day after delivery.

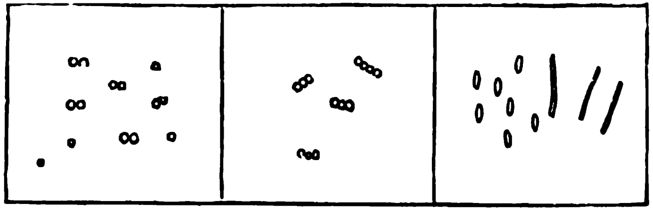


FIG. 184.—Microbes often met with in small quantities in the lochia of healthy puerperæ. (*Doleris.*)

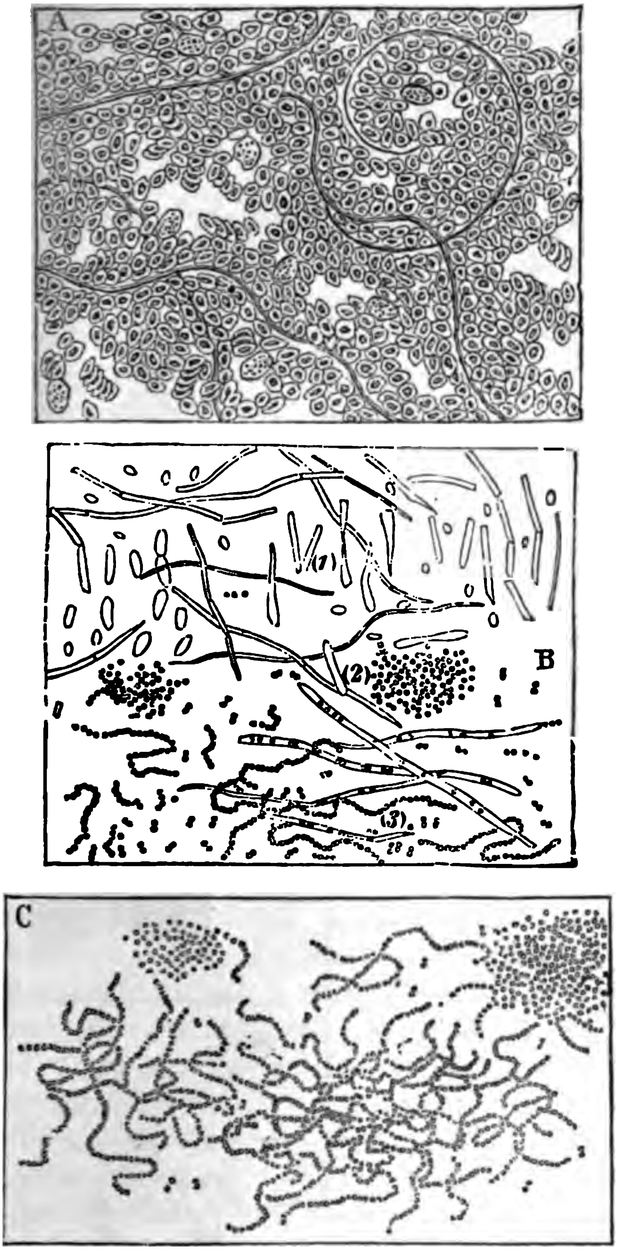


Fig. 185.—*A*, Septic vibrio from the blood. (*V. Repens.*) *B*, Septic bacteria of different shapes; Zooglea; (3) Chains of micrococci developed in pus contained in a lymphatic vessel. *C*, Chaplets ained from culture of the blood. (*Doleris.*)

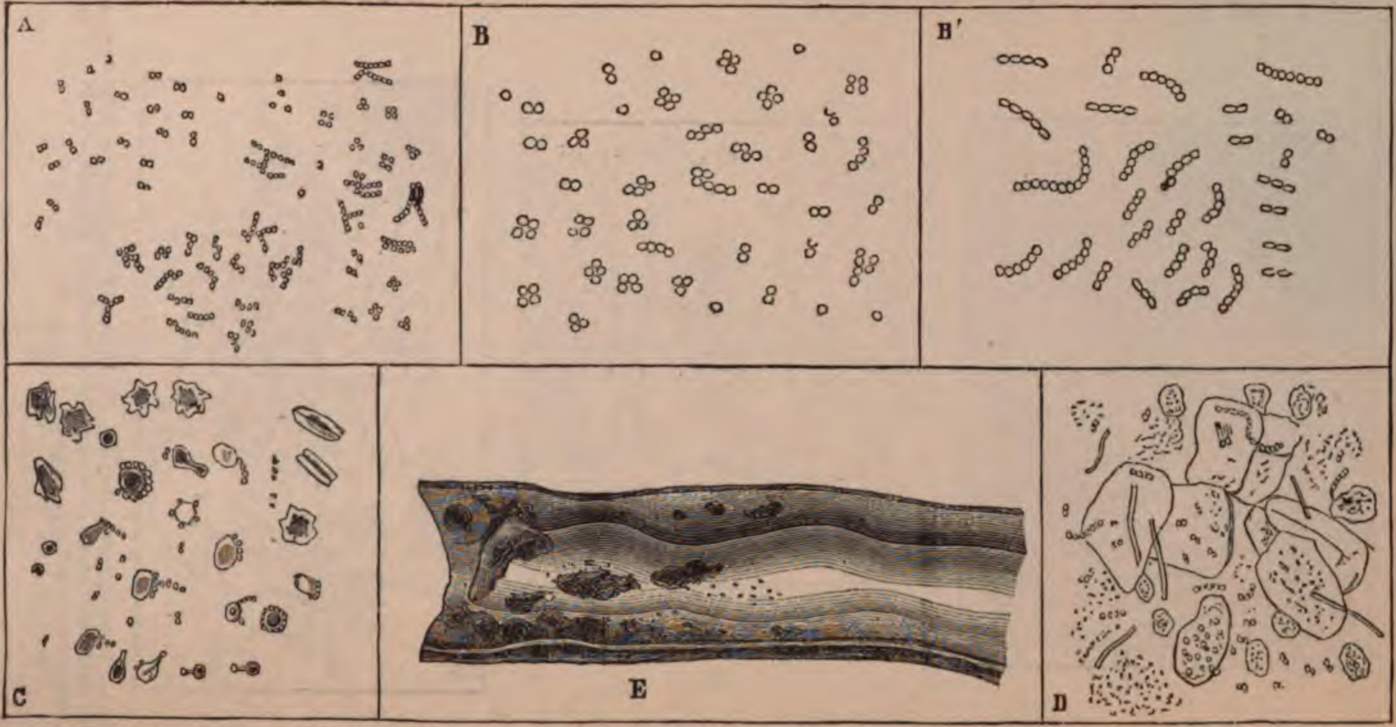


FIG. 186.—*A*, Microbes from pus and blood, 24 hours after culture. *B*, Larger microbes (case of cerebro-spinal meningitis) 12 hours after culture. B′, The same 70 hours after. *C*, Deformed globules. *D*, Appearance of the microbes in the lochia. *E*, Clot in the crural vein. The black points are groups of endothelial microbes. (*Doleris.*)

at once in large numbers, to such a degree, that it seems as though we had made artificial pus.

After delivery, everything favors rapid absorption by the lymphatics. When the uterus contracts, the intra-parietal branches, true enough, are closed, but those in the sub-peritoneal layer are widely open. In the sub-serous reticulum the organisms collect and develop, and they spread rapidly to distant parts. No law presides over the distribution of the microbes, whence the varied resulting lesions, abscesses, peritonitis, pleurisy, meningitis, arthritis. Infection by the lymphatics is always the first in order. The blood is only reached secondarily through the thoracic duct, and from a clinical standpoint cases may be divided as follows:

1. Those rare but actual cases of rapid septicæmia characterized by the early introduction into the blood of the long septic bacteria, isolated or united with the micrococcus.

2. Those more common cases of puerperal infection, characterized in particular by the presence of the micrococcus in the lymphatics, the tendency to suppuration, and the occurrence of true septicæmia ultimately, that is to say, the invasion by the septic bacteria, which are sometimes found in the lymph or the blood just before the agony. This is the suppurative lymphatic, serous, purulent form.

3. Cases of pyemia with phlebitis and thrombosis, answering to surgical purulent infection.

4. Finally, the slow, progressive pyemic forms, of long duration, frequently characterized by the presence of puerperal pernicious anemia, or of abscess, or of chronic metritis.

To resume then: While we might confound all the varieties of puerperal infection under the name septicæmia, with variable forms and variable pathological products, still I believe myself authorized, following Pasteur exactly, and considering the organism from the standpoint of specialization of its product and not from that of its probable origin, in separating morbid infectious germs into two great categories

1. Cylindrical septic bacteria (rapid septicæmia.)

2. Micrococci in chains (attenuated septicæmia); under the shape of couplets; under the shape of dots or points.

I admit, therefore, that the micrococcus is always characterized by an attenuation of the septic nature of the products, and that the double dot or point is the true pyogenic element." (Doleris.)

These researches of Pasteur, then, seem to throw great light on the nature and the method of the production of puerperal affections. Raymond has resumed the question as follows: "When the lochia of a healthy puerpera are examined under the microscope, either none at all or else a few micro-organisms are found. If, on the other hand, the lochia of a woman on the point of having some puerperal affection be examined, we are struck by the large number of organisms present; and if she dies, in the pus of the peritoneum, in the uterine lymphatics, in the exudations of the pleuræ, in the metastatic abscesses, etc., the same organisms exist as were found before death in the lochia. By means of those valuable and delicate culture processes which were devised by Pasteur, he has been able to demonstrate in the blood before death microscopic organisms, touching, as it were, with the finger, the cause of the poisoning. Further still, Pasteur, in the services of Hervieux and of Championnière, has been able, by the simple microscopic examination of the lochia, to predict the appearance of affections before the clinician even suspected them. During the discussion before the Academy of Medicine, Pasteur showed an organism in chaplets of many grains which he had frequently found in the lochia of women dying from infection, and he has seen them in myriads. He has found this little organism, under such circumstances, everywhere in the body. Is this the only organism met with in the course of puerperal fever? Must we attribute the disease to it? Pasteur thinks not. Puerperal fever has not its special microbe, but there are many which may affect the puerpera in one or in another way, according to its number. Indeed the micro-organism which kills the woman may even not have any infectious property. Injected subcutaneously it may produce no symptom. It is thence to the special conditions of the uterine wounded surface that the puerperal accidents are due. The organism developes rapidly and in abundance in the lochia within the uterine cavity. It penetrates readily to the neighboring peritoneum, and there, by the fact of rapid multiplication, produces peritonitis with pus full of the micro-organisms which Pasteur has shown us. In case the peritoneal cavity does not afford conditions favorable for development the affection will be more limited, and instead of intense general peritonitis, we will have localized pelvic peritonitis, which is less acute. It is equally easy to understand the development of cases of phlebitis and of pelvic peritonitis. It is the situation of the wound, the connections of the uterus, which increase the danger, and this is what is peculiar to the puerpera. If the infectious microbe reaches her by any one of the many open routes, then infectious and rapid septicæmia develop, and those sudden deaths may occur which have so frequently swept out maternity hospitals. The blood then offers the characteristics of the typhoidal diseases, a fact on which the essentialists lay great stress in behalf of their theory.

When we remember the protean aspects of puerperal fever, it is difficult to grant that always one single infectious agent, one single micro-organism, is the cause, all the more so when we bear in mind the infinite variety of organisms in the lochia of the diseased puerpera, fresh legions of which are constantly being introduced into the uterus. Each invasion causes chill, and new elevation of temperature, and in those cases where the battle is prolonged, death results only after many days of suffering, with alternations of betterment and of aggravation. In these instances, if the uterine lymphatics are the route by which the microbe enters, we will witness the development of lymphangitides, purulent pleurisies, metastatic abscesses, etc., and the case must be a rapid one indeed where we will not find visceral lesions, peritonitis, or suppuration. The woman dies septic, even as may a man after an amputation.

Such is Pasteur's theory, but it is not as yet accepted by all authorities, and the following are the objections made to it: If these germs are everywhere around us, if we inspire them by hundreds, if they infect every object near us, why is it that they only exert their noxious influence on puerperæ in lying-in wards, while in our private practice they are innocent of harm? Has not the puerpera in the country an open uterine wound, even as has the puerpera in a hospital? The germs reach the one as well as the other, and yet the one almost always recovers, while the other frequently dies. What do the germs do in the intervals of puerperal fever epidemics? To-day our wards are perfectly healthy, the puerperium is unclouded; but let the number of lying-in women increase, and the disease breaks out and the mortality is fearful.

Finally, how have the germs gained access in those most frightful of all cases, where death supervenes in a few hours? The uterus, perfectly contracted, has left no open-mouthed vessel, the lochia have not been at all fœtid, there exists neither phlebitis, nor lymphangitis, nor phlegmasia of any kind. How then have the germs entered in order to invade, not the puerpera, but the gravida and the infant she is carrying, and the nurses as well, not pregnant, but living in the midst of puerperal women? For even these latter may become affected, and present the peritonitis which is so characteristic of puerperal infection?

Pasteur replies that the atmosphere contains but few germs, that they are particularly spread over solid objects, where they adhere and where they accumulate, and that it is especially by the accoucheur's hand that they are brought to the puerpera, as well as by the towels, etc., in hospital wards.

All the above objections, however, are not refuted by this explanation, and further still, we might state others, as for instance, how explain by the germ theory peritonitis observed by Lorain in fœtuses still within the uterine cavity? We must admit that the germs have penetrated the multiple epithelial layers which, at the placental site, separate the maternal from the fœtal organism. But experience up to the present teaches us that no organic matter passes from the maternal into the fœtal blood. If the germ theory is true, we must grant either that the peritonitis observed by Lorain was not of septic origin, or else that these proto-organisms penetrated into the fœtus by effraction." (Raymond.)

It is apparent then that many a point is still to be elucidated, and that we are far from having reached a definite solution. There is, however, one fact on which every one agrees, and this is that puerperal fever is eminently infectious, and that epidemics of puerperal fever are the immediate result of this contagion. The idea of the transmissibility of puerperal fever is to-day unanimously accepted. But what is the manner of infection? Here still, the vast majority of accoucheurs admit that, whether infection be due to auto- or hetero- cause, it occurs through the wound, whatever the conveyance of the infectious agent. If we are dealing with auto-infection, this is created at the wound-site itself, by the decomposition of putrid placental *débris*, or lochia, or blood clots. If, on the other hand, we are dealing with hetero-infection, it is conveyed by a direct cause, whether accoucheur, nurse, clothing, etc.

Doleris, on the contrary, who grants but a single cause, the microbe, does not admit auto-infection properly so-called. The morbid germ, the microbe, must be introduced into the economy, and for him, hence, it is always hetero-infection. But, and here we agree with him perfectly, if infection by the wound is the most frequent, this is not the only route of access, there are others to which we proceed to refer.

1. *Contagion by the Wound.*—*a.* In certain instances there exist virulent vaginal discharges before labor; certain infusoria, which are afterwards found in the lochia, may pre-exist in the genital passages—in a word, the vagina contains before labor infectious germs introduced by chance. *b.* Contagion may occur through the linen, towels, syringes, the injected fluid even, which are often filled with inferior organisms of all sorts. *c.* It may occur through dirty, improperly cleansed instruments. *d.* Through septic uterine *débris* in the curtains, the sheets, the bed-pans. *e.* Through an infant contaminated by ecthyma, abscess, erysipelas, purulent ophthalmia, peri-umbilical lymphangitis, etc. *f.* Through the nurse, the physician, etc. *g.* Finally, through propinquity to a surgical service where there exists lymphangitis, erysipelas, etc.

The above instances of contagion have been observed over and over again, both in private and in hospital practice. We would cite simply the epidemics observed by Danyau, Trousseau, Dubois, Wells, Atthill, Boardman, Hecker, Holmes, Braxton-Hicks, Thierry, and others.

Having thus established the fact of contagion, we need not be astonished to see the disease develop simultaneously, rapidly, and successively, in a large number of puerperal women, when they are crowded together. Epidemics, indeed, are purely the result of a wider dissemination of the contagion, the cause and the mechanism remaining the same. In order that an epidemic may exist, we need the infectious spark in the shape of the germ, and the diffusion of this germ. Now one single circumstance brings together these conditions, and this is, says Doleris, *overcrowding.*

2. *Overcrowding as a Cause of Epidemics.*—1. The morbid germs are thus multiplied. 2. The points of contact are thus increased. 3. There is insufficient aeration, oxygenation. 4. The resistance to disease of the woman is thus lessened. Now where are these injurious conditions better found than in the lying-in wards of maternities, where the same nurse cares for the well and the sick puerperæ, where isolation wards do not always exist, where instruction is given, and where, it must be said, disinfection is not practised as vigorously as it should be. Is it surprising then to find such fearful mortality, often, compared to that in private practice?

Besides these facts of contagion by the vaginal or uterine wound, it seems to us impossible not to admit contagion by other routes. How otherwise explain those cases noted by Depaul, Tarnier, Hervieux and others, where women were infected before labor, and therefore before the existence of any wound? And how explain those instances where young nurses have been poisoned by the simple fact of sojourn among puerperæ during an epidemic? Tarnier says: "It is probable that by the lungs, offering as they do conditions favorable for absorption, infection often, if not always, occurs." Others grant absorption by the intestines: "Whenever some cause or other destroys the integrity of the mucous membrane or augments the proportion of the germs, whether absolutely by the direct introduction of septic substances by the digestive tract, or relatively by an arrest of the fæcal current, then the fight becomes unequal, and septicæmia results." (Doleris.)

The experiments of Schweninger, 1866, of Hemmer, Coze, Feltz, 1869, Meyer, Legros, Humbert, 1870-73, Doleris, 1879, have conclusively proved the possibility of infection by the intestine.

We would resume then as follows: Although we may no longer consider puerperal fever from the standpoint of the older writers, we cannot deny but that there exists an *ensemble* of phenomena, of puerperal accidents, which are the result of puerperal septicæmia, and which we may collect under the generic classic name of puerperal fever. These affections are the result of infection, and they are consequently infectious to the highest degree. Rare endemically, they are met with in particular in Maternities, where they assume the epidemic form. The most recent researches point to their origination from the penetration into the economy (by the veins or lymphatics, often by both simultaneously) of a septic agent (cadaveric poison, product of decomposition according to some, proto-organism according to Pasteur), a septic agent which may gain access to the economy either, and this is the rule, by the vagina and the vaginal and uterine wounds, or else, exceptionally, by the lungs and intestines. According to the different entrance points, and according to the varied conditions of development in the economy, this agent will determine different affections and phenomena, which will impress on each epidemic its special characteristics.

[Among the recent contributions to the subject of the relationship existing between micro-organisms and puerperal fever, we would note the article published by Lomer, of Berlin, in the *Am. Journal of Obstetrics*, July, 1884. The aim of the writer was to collect the *facts* which have been offered as such regarding this relationship, and we here insert his conclusions as being representative of the most recent views on this subject. After an impartial statement of the knowledge derivable from pathological anatomy, and from culture experiments, Lomer studies the relation of scarlet fever, diphtheria, erysipelas, pyemia, etc., to puerperal fever, and then draws the following conclusions: 1. Of all organisms found in puerperal fever, the chain-like micrococci seem to be those to which we should especially direct our attention, and which are the most important. 2. When in any case of puerperal fever their presence has been detected in the exudations, they have also been found in the deeper organs. 3. They have been found in erysipelas, scarlet fever, diphtheria, and puerperal fever, and in each possess the same form, and show the same disposition towards fertilizing fluids and coloring matters. 4. Although it is very probable that different varieties do exist among these diseases, we as yet have no positive evidence of the fact. 5. A differentiation according to size is an extremely difficult, perhaps hopeless task, but according to manner of growth, it may be possible. 6. Vaccinations, with cultivations of these micrococci from different diseases, have proved fatal to animals, but have given no typical or characteristic results. 7. Chain-like micrococci have also been found in infected wounds, and in the blood of pyemic patients. 8. The pathologico-anatomical investigations thus show that these clinically related diseases (puerperal fever, erysipelas, diphtheria, scarlet fever, and pyemia) possess similar micro-organisms. 9. Besides the chain-like form, other micro-organisms may be present in puerperal fever (*i.e.*, mixed infection.) 10. The presence of these latter in the cadaver does not always prove that they existed in the living body; on the contrary, they are often the result of post-mortem decomposition. 11. It is probable that the processes of decomposition are sometimes present before death actually takes place; different varieties of micro-organisms therefore found, for instance, during the death struggle, may have nothing to do with the cause of the disease. 12. It is as yet impossible to classify puerperal fever, as regards course and prognosis, according to the varieties of micro-organisms found (Doleris), or according to their mode of invasion (Frænckel.) 13. In some cases no micro-organisms have been found, but this does not prove that they did not exist.

Such may be considered a fair statement of the views held to-day in Germany, and largely in this country, in regard to the relationship existing between germs and puerperal fever.

Robert Barnes, in his system of obstetric medicine and surgery, thus summarizes his views in regard to puerperal fever: "By the term puerperal fever, we must understand fever in a puerpera. As fevers of various kinds may assail non-puerperal persons, so they may assail puerperæ. We must, therefore, abandon the vain attempt to find one definite puerperal fever, and we must recognize the clinical truth that there are puerperal fevers. There is, however, one constant underlying condition of all the puerperal fevers, that is, the puerperal constitution. This puerperal constitution is the soil in which all the disturbing influences work, in which noxious matters, from whatever source, germinate; and which, without always destroying the individual properties of the foreign poisons, imparts to all some common features. It is also highly probable that, under the mutual reactions of ingested poisons, and the puerperal constitution, new innominate poisons may be engendered. The puerperal fevers may be classified under the two great divisions of autogenetic and heterogenetic. The autogenetic fevers are: 1. The simple excretory puerperal fever, the result of endosepsis, or the arrest of the excretion of waste stuff of involution. This form complicates all other fevers. It is in itself the only true puerperal fever. 2. The fever resulting from the absorption of foul stuff from the parturient canal, either from unbroken mucous surface, or by the open mouths of vessels, or from traumatic surfaces, this is autoseptic. This form also is likely to complicate other fevers. 3. This, the proper septicæmic puerperal fever, is revealed under the forms of metritis, peritonitis, pelvic cellulitis, thrombosis and general toxemia.

The heterogenetic fevers are due to the reception of a poison from without. These may be divided into: 1. The cadaveric poison, the septic stuff from other puerperæ, animal poisons of obscure origin. 2. The known zymotic poisons, as smallpox, scarlatina, typhoid, diphtheria, erysipelas.

All the various modes of infection recognized as acting in non-puerperal subjects act in the puerpera. But she is especially open to invasion by direct inoculation of the parturient tract; and empoisonment by the ordinary routes is enormously favored by the peculiar activity of the absorptive function of the puerpera. Pathological anatomy fails to differentiate the fevers. In cases of various origin the anatomical changes may exhibit close similarity. The constancy of pathological effects illustrates the proposition that all the fevers acquire some common character from the underlying puerperal constitution. The symptoms at the onset of puerperal fever rarely indicate with precision the source or nature of the fever. Most are ushered in by the common signs of toxemia. Differentiation, or the identification of the particular poison at work, is established sometimes by watching the clinical evolution of the disease, by the antecedent history, by search into the surrounding influences, and not seldom the problem baffles solution. We must then be content with the general fact that we are dealing with a puerperal fever."

In the *Am. Journ. of Obstetrics* for May, 1886, Dr. Emil Noeggerath described a species of puerperal fever dependent on a microbe which he cultivated and is represented on the annexed plate. The special features of this variety of puerperal fever, as deduced from study of a reported case, are that: "1. There is an invasion of a septic element, notwithstanding the most complete aseptic management of the confinement. 2. Long duration and obstinacy of a moderate amount of fever against early, persistent, and energetic local and internal treatment. 3. Its remittent, almost intermittent character. 4. The inflammatory action of the poison upon the tissue of the uterus. 5. The absence of deposits in remote organs, notwithstanding the length of time the patient was under the influence of the fever germs." The special microbe on which this variety of puerperal fever depended belonged to the bacteria called saprogenes, and Noeggerath thus describes it: "Its length, although varying in size according to the medium on which it is raised, is between a large coccus and a bacillus. It is a short rod, separated in the middle by a slight constriction just visible with a very high power, which gives it the appearance of two oblong cocci joined closely together. Sometimes two or three rods are joined in one. Fig. 1 (*vide* plate) represents, near *a*, their characteristic appearance. It is about one-quarter larger than bacterium termo."

Fig. 4 shows this microbe growing in meat-peptone, when it acquires the shape of a cone, point downwards, and it resembles very much a comet with a large nucleus. As it grows, it developes a very intense odor of putrefaction. Fig. 3 represents the ordinary puerperal strepto-coccus, for purposes of comparison. "The life history of this parasite, enables us to classify it among the saprophytes, and we must call the fever described, not as symptomatic of septicæmia, but of sapremia. This distinction is now fully established as existing in fevers occurring during the puerperal state, especially through the researches of Duncan and

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on which Noeggerath draws from his
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is no guarantee of a sanitary condition

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future a better explanation of the
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—Ed.]

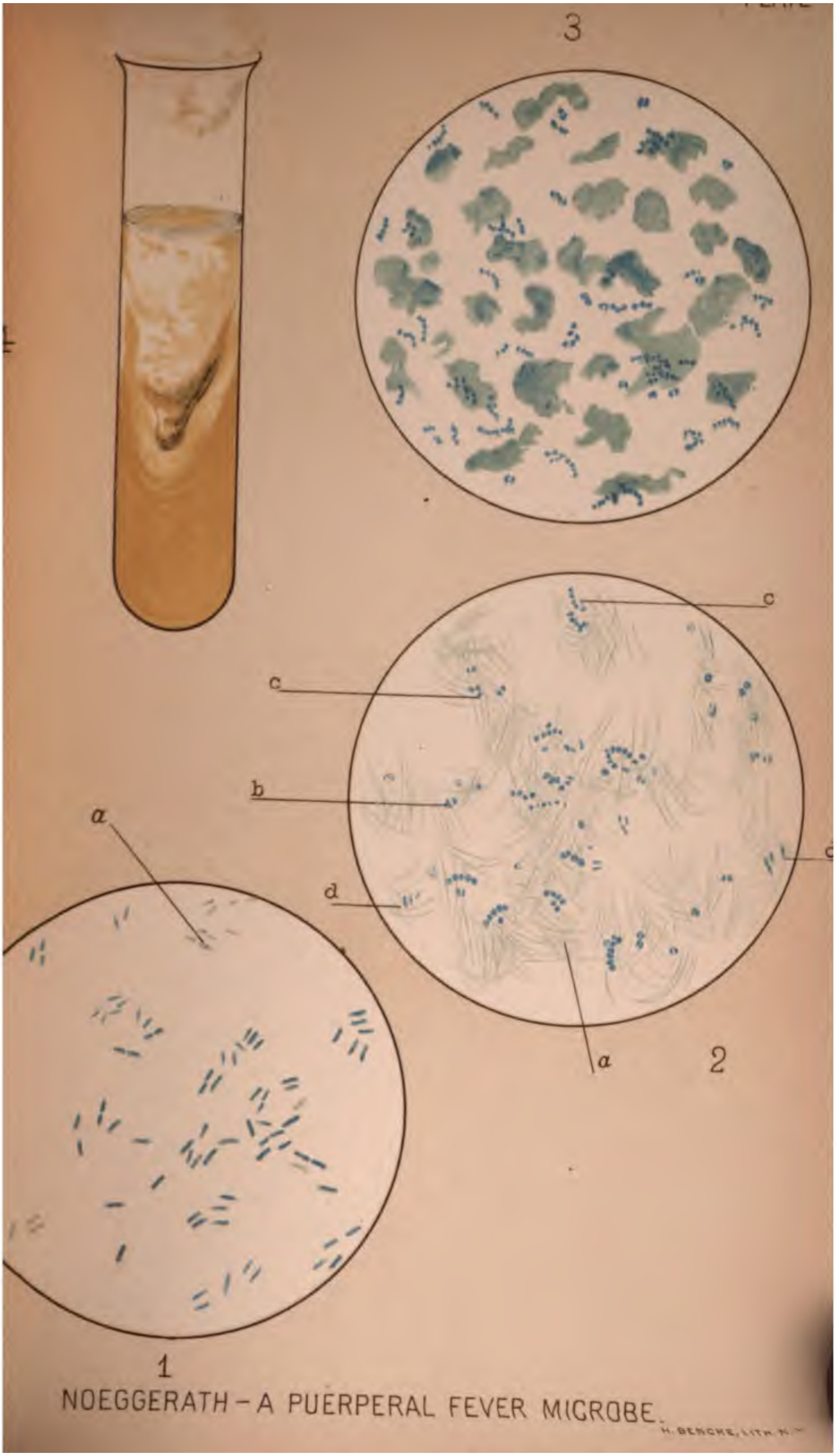
EXPLANATION OF PLATE VII.

FIG. 1.—Noeggerath's saprocyte.

FIG. 2.—*a,* Slender bacillus, like that of tuberculosis; *b,* large diplococcus; *c,* coccus in chains; *d,* rod bacteria.

FIG. 3.—Common puerperal streptococcus.

FIG. 4.—Noeggerath's saprocyte in the culture fluid.



NOEGGERATH – A PUERPERAL FEVER MICROBE.

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CHAPTER II.

FORMS OF THE DISEASE.

UNDER what forms now do we meet with puerperal affections? They are as numerous as they are varied, as is apparent from consulting the descriptions of different epidemics of puerperal fever. Whence the divisions into metritis, metro-peritonitis, peritonitis, phlebitis, lymphangitis, purulent infection, pleurisies, endocartitis, etc. Whence also those numerous diseases described by Hervieux in his work, and which, from our standpoint, are only manifestations of general infection, of puerperal septicæmia. We propose here simply to study the clinical side of puerperal affections without entering into elaborate detail. We will mention purely the most marked forms of what was formerly called puerperal fever, and to-day is known as puerperal septicæmia.

At the outset, as has been so well shown by Pajot, there is a vast difference between the lesser puerperal state, that is to say, the modifications in the organism during pregnancy and lactation, and the greater puerperal state, that is to say, the modifications which occur in the puerpera.

"Let us examine," says Pajot, "the organs on trial, and in no respect do the physiology and the pathology of the puerperal state resemble the physiology and pathology of pregnancy. All tends to hypertrophy during pregnancy; after delivery, it is atrophy which is the predominating factor. The nosological line of demarcation is just as striking." And Raymond, after having quoted the above words of Pajot, adds with justice: "If we consider the general modifications impressed on the economy by pregnancy and the puerperium, we find marked differences. In the first state, the equilibrium is with difficulty preserved, seeing that it is disturbed day by day; the mother must look after her own nourishment, and that of her child; the co-efficient of distribution varies each hour so to speak. In the puerperal state the inverse obtains: the alimentary decline produced by lactation is lowered after a certain time; if it increases occasionally, it is never with the same regularity and the same continuity as during pregnancy. In the gravida, the alteration of the fluids of the body is qualitative; there are never foreign elements in the economy. In the puerpera it is very different. Nutrition tends to become normal, and *per contra,* the blood may contain septic products. There exists then a difference between the physiological and the pathological processes, which precede and follow delivery."

During the puerperal state, indeed, what changes in the circulation, the temperature, what variations in the secretions and the excretions; what modifications and transformations in the genital organs, and, in consequence, what transitory or persistent accidents, what diverse and multiple diseases!

Leaving aside all theory, and basing ourselves purely on clinical data, we may divide puerperal accidents into two great classes: 1. Those which are almost always recovered from. 2. Those which almost certainly kill. The first are frankly inflammatory, with a tendency towards localization, and retaining the characters of a simple inflammation; the others are strikingly infectious in character, reacting on the entire economy, and accompanied by diverse manifestations in organs more or less remote from the starting-point of the infection.

A. *Accidents which are almost always recovered from.*—Such are metritis, peri-metritis, pelvic peritonitis, abscesses in the broad ligaments, etc. These remain, as it were, local, and are dangerous purely from the fact of their presence. Being essentially inflammatory in nature, they follow the ordinary course of an acute inflammation, lasting in the acute state for a few days, to terminate in suppuration, or, as is the rule, in resolution, convalescence being tardy. These forms, however, may really be due to infection, and then we see them in the shape of gangrene, diphtheria, croup, of the Germans. They become then exceptionally grave, and instead of cure, it is death which is the rule, death occurring quickly, the disease approaching in type what Peter calls the "typhus of the puerperium."

The most grave expression of these semi-inflammatory and semi-infectious forms, and which may be considered the connecting link between the purely inflammatory and the deadly forms, is peritonitis, puerperal metro-peritonitis, and this is ordinarily the result of true infection. Sometimes primitive, and again secondary, that is to say, complicating metritis, its progress is rapid, sometimes lightning-like, it is accompanied by serous and sero-purulent exudations, and it usually ends in death.

B. *Accidents almost always fatal.*—The first variety under this heading, is usually the result of putrid infection from decomposition of placental *débris*, shreds of membranes, clots retained in the uterus, gangrenous eschars in the vagina or the uterus. Infection of this nature is usually seen after incomplete miscarriage, or when a dead putrid fœtus is in the uterus. Its progress is slower, and when the foreign body is removed, it may terminate in recovery, and it is possibly the morbid form where our therapeutics avail the most. But, unhappily, this removal of the infectious mass is not always possible, or does not occur spontaneously, and the patients, poisoned by the detritus, die at the end of a variable time, usually after a somewhat prolonged interval. [See Vol. II., under Miscarriage, for remarks bearing on this point.—Ed.]

The second variety is purulent infection, identical to that in case of major wounds, beginning, in general, more slowly than the preceding, and accompanied by the same local and general phenomena as in case of purulent surgical infection, and also with metastatic abscesses, internal or external, emboli, etc. Cure is absolutely exceptional.

The third variety constitutes what we call puerperal septicæmia. Here there is no proper localization, but all the organs of the economy may be invaded simultaneously or successively, and thus the patients present, alternately, morbid phenomena from the side of the abdomen, pleura, heart, brain, lungs, joints, skin, etc., without our being able to say what in reality was the cause of death. It is in these instances that the special alterations of the blood are found on which Depaul, Dubois and Hervieux, based the theory of essentiality.

Such are the chief varieties of affections which dominate, we may say, the pathology of the puerperal state. We must add two more which belong to the puerperal period, although they differ notably from the preceding. The one is puerperal mania, which we studied in connection with the psychical disorders of pregnancy; the other is a late accident of the puerperium, since it rarely appears before the tenth to the twelfth day, often later, and this is *phlegmasia alba dolens*.

Finally, we would mention the worst accident of all, sudden death, which occurs unfortunately too frequently without any premonitory symptoms.

It will be noticed that we do not use the terms phlebitis, lymphangitis, adeno-lymphitis, and that we make no attempt to differentiate them. Whether the poison, the germ, the infectious microbe, enters the economy by the veins or the lymphatics, the effects at the bedside are such as to enable us to classify the case under one or another of the varieties mentioned. The diagnosis of lymphangitis or phlebitis can only be confirmed at the *post-mortem*, and such a diagnosis made at the bedside is entirely too subtile, and devoid of practical interest. Such a distinction is certainly of importance theoretically, but in practice it is not. We will describe clinically only the following varieties:

1. Inflammatory affections localized in the uterus or its adnexa.
2. Puerperal peritonitis.
3. Putrid infection.
4. Purulent infection.
5. True puerperal septicæmia.
6. Phlegmasia alba dolens.
7. Sudden death in the puerperal state.

Before entering upon a description of these different forms, we would mention that when puerperal fever becomes epidemic:

1. The same affections occur in all the diseased puerpera, peritonitis, pleurisy, phlebitis, lymphangitis, and the same lesions are found in all the women.

2. Epidemics are always preceded in Maternities by diseases of the children, enteritis, ophthalmitis, etc.

3. The surgical wards are the seat of erysipelas, purulent infection, hospital gangrene, etc.

I. PUERPERAL METRITIS.—INFLAMMATORY AFFECTIONS LOCALIZED IN THE UTERUS, ITS ADNEXA, AND NEIGHBORING ORGANS.

Inflammatory processes may affect each of the organs in the pelvis separately, or else spread from one to another. Thus the uterus alone may be affected, and we have a metritis with its varieties: endometritis, when the mucous membrane is alone diseased, and this may be simple, or gangrenous, diphtheritic, or ulcerative; or else the metritis itself may be accompanied by inflammation of the serous covering of the uterus, and there may also exist peri- and parametritis, abscess, oöphoritis, salpingitis, etc. Each of these affections are characterized by peculiar symptoms, it is true, but they are generally insufficient to allow of precise clinical differential diagnosis. These affections, indeed, are masked under the symptoms emanating from the accompanying pelvic peritonitis. Metritis is the initial phenomenon, and the other lesions are the result of extension.

We must here draw a sharp distinction between primiparæ and multiparæ. While it is not rare in the latter to witness these inflammatory processes succeed the after-pains, which occur as a rule in them, and which are then peculiarly intense and persistent, the same does not hold true of the former, where the disease usually developes abruptly without premonition. In primiparæ, indeed, after-pains are exceptional, and the disease breaks out while the woman is in nearly perfect health. In the multipara, on the contrary, after-pains are nearly the rule, but while these gradually diminish, to disappear entirely at the end of about thirty-six hours, or else only to reappear when the child nurses, when they are about to be followed by inflammatory symptoms, they not rarely resist all treatment, and persist with a notable intensity and frequency, until the inflammatory process sets in. Usually, in these instances, there is a sensation of weight in the abdomen, which persists between the after-pains, and is accompanied by a hardness of the uterus, which is in marked contrast with the softness it customarily presents during the first few days of the puerperium.

It is rarely before the third or fourth day, sometimes, however, as early as the second, that the initial symptoms appear. Up to this time the general and local state is satisfactory, there is no fever, when, of a sudden, appear simultaneously, as it were, three symptoms, two of which are absolutely constant, and the third nearly the rule. These three symptoms are: 1. Pain; 2. fever; 3. chill.

1. *Pain.*—At times insidious, dull, continuous, and again sudden, very acute, pain is characterized by the fact that it is always spontaneous and always increased by pressure. Further, there is always one spot where on pressure it has a maximum intensity. Although, indeed, the entire uterus is sensitive to pressure, it is in particular in the lateral regions that pain is most intense, and in those instances where it is least marked spontaneously, and where it shows itself simply by a sensation of weight, and tension in the loins and abdomen, it suffices to press with the finger to the right or left of the uterus in order to excite the pain more acutely.

Usually this tenderness on pressure is on both sides, but it is not rare for it to be unilateral and more pronounced on one side than on the other. The uterus, checked in involution, is harder, tenser, more resisting. At times, indeed, it seems to be more voluminous. If the abdomen is palpated beyond the region of the uterus, it is painless—in a word, the pain is localized over the uterus, the abdomen is either not tympanitic, or else only to a degree, in the hypogastrium. The striking point then is that the pain is localized purely over the uterus.

2. Coincidently with the pain, there is rise of temperature, which, while moderate in general, is very marked. The pulse is rapid, although usually not above 100 to 110; ordinarily, indeed, it remains at 88 to 104. The temperature rises from 101° to 103°, rarely reaching 104°. The skin is hot, bathed in perspiration, but the facies is calm, not altered, and the general state is fairly satisfactory. The patients, nevertheless, complain of a feeling of malaise in addition to the pain.

3. Usually, when pain and fever appear, the patients have a chill, fairly violent, lasting from a few minutes to one quarter of an hour or more, and this is frequently at the beginning of the febrile period. Often, however, in multiparæ, this chill is lacking. While in them the disease developes insidiously, so to speak, while the metritis, the inflammation of the uterus, follows progressively on the after-pains, in primiparæ the onset is almost always more sudden, and to the well-being of the day before there succeeds chill, fever, pain, these three phenomena appearing simultaneously and more or less acutely.

At the same time the lochia are in part suppressed, diminishing notably, becoming reddish and fœtid, occasionally excessively fœtid. If the disease breaks out before the establishment of lactation, this does not appear, or only incompletely. Constipation is the rule. Another phenomenon appearing simultaneously is arrest of involution. The uterus, instead of undergoing the retrograde changes which are usual during the early days of the normal puerperium, remains large, heavy, and at the same time is painful. Not uncommonly it increases in size, and on palpation it is found five to six finger breadths above the pubes — sometimes almost reaching the umbilicus, and feeling resistant, instead of having the characteristic resiliency. On vaginal examination, this canal is hot, painful, and touching the uterus evokes the same painful sensations as external palpation. The uterus is less movable. The pain evoked bi-manually is ordinarily more acute on one side than on the other, and not infrequently within the first few days, there exists bogginess in one or another of the *culs-de-sac*, which is an indication of the extension of the inflammatory process to the neighboring parts. There exists in addition to metritis, a para- and a peri-metritis.

The above state persists for a few days, and then either the disease tends towards cure, or else it is complicated by inflammatory processes in the organs adjoining the uterus. If the case remains uncomplicated, and the metritis tends towards cure, the pain gradually diminishes, the fever persists only towards evening, and is characterized purely by a gentle elevation of the pulse and of the temperature. The pulse, which in the morning was 100, rises in the evening to 104 or 108, and the temperature, about 101° in the morning, rises to about 103° in the evening. The uterus begins to involute, very slowly however, and at the end of five to six weeks the patients may be pronounced cured. This is the case where the disease has remained local in the uterus.

Far otherwise is it the case usually, however, for then the inflammatory process spreads to the neighboring organs, the annexes of the uterus, the broad ligaments—in a word, we witness the development of peri- and parametritis, abscesses, etc. Then the scene changes a trifle, according as the process is localized at one or another point of the pelvis. But that which dominates still, and what indicates propagation, is the reappearance of the three signs, chill, fever, pain. The chill returns with the fever, but the pain is in some respects peculiar, its maximum being no longer just laterally of the uterus, but, according to the case, around this organ, in the iliac fossæ, in the hypogastrium, invading the entire abdomen below the umbilicus. At the same time palpation gives very different sensations. While when the uterus alone is affected, this organ only is hard, the rest of the abdomen being soft; when peri- or parametritis, abscess, etc. exist, the entire region invaded by the inflammatory process is tense, owing to the deposition of plastic material, very appreciable to the touch, painful at the outset, and filling one or another of the hypogastric regions according to the site of invasion. At first this plastic mass is readily isolated, but later the uterus is surrounded by it, and in a few days the bi-manual simply reveals density all around the organ. This mass is rarely smooth and uniform, but presents here and there projecting points, harder in places, and exquisitely sensitive on pressure. The vaginal *culs-de-sac* bulge out, the uterus is deviated from the mid-line, and immobilized. Whatever the name given to this process, whether peri-uterine phlegmon, peri- or parametritis, pelvic peritonitis certainly exists, and the disease may follow two different courses. In the one, happily the most common, this indurated mass, after having increased for a few days, begins to resolve very slowly without suppuration, requiring a number of months, the general health improving as the mass disappears entirely. But, on the other hand, this mass, so hard at the outset, softens in places, ends by suppurating, and finally breaks, usually into the vagina or the rectum. The tumor then diminishes rapidly, and often recovery is speedy; usually, however, at the end of a few days, chill and fever reappear, the temperature rising to 104° or over, and the tumor increases in size, the abscess having reformed, and thus many times we may witness the partial refilling and evacuation of the tumor, until it empties itself definitely, and recovery ensues. In other instances, again, the fever remains constant, and the patients, worn out by prolonged suppuration, succumb eventually to hectic fever.

Such is the ordinary clinical picture of the progress of puerperal metritis, when it is present in its most striking form. In certain cases, however, the progress of the accompanying pelvic peritonitis is still more insidious. The general phenomena are scarcely pronounced, the febrile reaction insignificant, the abdominal tenderness not marked, the tumefaction and bogginess scarcely apparent, and it is only the touch which will reveal the existence of the process. Cure, in these instances, is the rule. Unfortunately, by the side of this relatively benign form, there are two others far more grave, for they are rarely recovered from, and these are the suppurative and the gangrenous forms of metritis.

In case of suppurative metritis, whether the process invades only the tissue of the uterus itself, which is exceptional, or the veins or lymphatics, which is the rule, the general phenomena are much more severe; if the pain is not more intense, the fever is and the pulse often exceeds 120 pulsations, the chills are more violent and more frequently repeated with notable irregularity. The temperature rises to 105° and even 106°, the facies alters, the patients are in a state of more or less pronounced stupor and prostration, the tongue is dry, sometimes there is vomiting of bile, but, curiously enough, the process does not tend so much to extend beyond the uterus. The abdomen is less sensitive, the same hard tumor is not found in the hypogastric or iliac regions, the uterus itself is less painful on pressure, but the general condition is far more serious, and in a few days, the general phenomena become more intense. The fever goes on increasing, and then appear delirium, coma, frequent, painful respiration. Fœtid diarrhœa succeeds to constipation, followed by involuntary dejections and death, which is the rule in these instances. The lochia are ordinarily suppressed, and where they persist a trifle the odor is more intense.

In gangrenous metritis the striking characteristic is fœtor of the lochia, so intense that it simply poisons the entire ward, and the color is blackish, the contents being often gangrenous shreds. Gangrene is rarely limited to the uterus alone, but spreads to the vagina and the vulva. Prostration is extreme, the facies greatly altered, the pulse small, worthless, very frequent. There is a general tendency to refrigeration. The face is pale, dusky in spots, the lips are blue, the eyes dimmed, the patients are in a constant state of semi-delirium, the abdomen is more or less tympanitic, and not very sensitive, and the patients again usually die. We would add, further, that gangrenous metritis, usually the result of trauma during operations, breaks out more quickly than simple or suppurative metritis, usually on the day following delivery, increasing progressively and ending in death within four to five days.

II. PUERPERAL METRO-PERITONITIS.

Puerperal metro-peritonitis is characterized by symptoms which prevent its being confounded with any other puerperal process, although at times it complicates metritis, and while it may have a prodromic period, usually its onset is abrupt, sudden, and within the three days following delivery.

The first symptom is a chill, usually a single one, lasting for one half to three quarters of an hour, violent enough to shake the bed on which the woman lies. This chill is accompanied by a sensation of extreme cold, so much so that it is with difficulty the patient can be made to feel warm, and this sensation may persist for a number of hours. The chill is rarely lacking, and is followed by an intense fever.

Coincidently with the chill, or immediately following it, there occurs pain, which is acute, spontaneous, extending over the entire abdomen, although localized in places at the outset. Beginning in the sub-umbilical region, the maximum point of the pain is in the latero-inferior regions of the uterus, at the site of insertion of the broad ligaments, and thence it spreads rapidly until eventually the entire abdomen is sensitive. This pain is spontaneous; the patients can scarcely bear the weight of the bed-clothing; it is increased by pressure, by movements; it has periods of exacerbation, when the women shriek out from its intensity. At the end of two to three days this pain ordinarily disappears, but we must be careful not to thence draw a favorable prognosis, for this insensibility of the abdomen is on the contrary, in the majority of cases, a sign of aggravation in the general condition. Under the effect of this pain the facies alters, becomes drawn, pale, and the vital forces diminish.

The abdomen swells, as it becomes painful, from paralysis of the intestines, and consequent distension with gas. At the outset, indeed, the coils of intestine are outlined under the skin. The percussion note is tympanitic all over the abdomen, when the distension is extreme. In general, pain is in inverse proportion to tympanites; the more the abdomen is distended, the less the pain and *vice versâ;* so that when the distension has attained its maximum, the abdomen is absolutely painless.

Concurrently with the chill, pain, and ballooning of the belly, appears fever, and here we must consider separately the pulse rate and the temperature rise.

The pulse rate in puerperal peritonitis is always very frequent, and this frequency is directly connected with the intensity of the disease. In general, at the beginning, it ranges between 110 and 120 pulsations, although it may rise above 120. It never, however, falls below 100. At first strong, full, resisting, it diminishes later in force as it increases in frequency, until it becomes very small and compressible as the disease approaches its height, and in the period of decline the pulse becomes so small and frequent that we cannot count it. At the same time, the skin becomes cold and covered with clammy sweat. Ordinarily the pulse is accelerated towards evening, diminishing towards the morning, but always remaining above 100. This is a point on which we lay great stress.

Like the pulse, the temperature presents variations, and like it a high figure is constant. While in simple metritis it rarely exceeds 103.4° to 104°, it is the rule in peritonitis to see it rise above 104° to 105° and over, and further the rise of temperature is not in proportion to the pulse rate. The elevation is most marked in the evening up to the end of the disease, when the temperature falls notably, at times becoming even sub-normal. As Wunderlich says: "Sub-normal temperatures are especially seen in peritonitis, and they should always awaken our suspicions. Death often occurs during this sub-normal stage."

Digestive disturbances are constant accompaniments of peritonitis, such as vomiting, diarrhœa alternating with constipation. Vomiting is only exceptionally absent, and appears usually as soon as the disease is well established, but after the occurrence of chill, fever, pain, and tympanites, usually at the expiration of ten to twelve hours. Often preceded by nausea and hiccough, it again frequently developes suddenly. In any event it has characteristic features. Constituted, at the outset, by water and mucosities, it soon becomes bilious and then spinachy. At first with effort, the vomiting gradually merges into pure regurgitation, becomes incessant, and in surprising amount. Vomiting of this nature usually persists throughout the course of the disease, although at times it ceases spontaneously at the end of twenty-four to forty-eight hours. The prognosis is no more favorable, however, unless the fever and the tympanites diminish concomitantly

At the outset, constipation is generally present, but to it succeeds a profuse diarrhœa, on the appearance of which the vomiting frequently ceases. The stools are at first solid, then glairy and involuntary, and finally are composed of bile mingled with bloody mucus. There is always marked fœtor to the stools. At the same time the tongue, which has been moist, thick, white, cleanses and becomes red, pointed, although still moist, only becoming dry at the height of the disease or before death. Then it is dry and blackish; the gums, the teeth, the inside of the lips being covered with blackish material streaked here and there with red. The speech becomes thick and difficult; the thirst excessive, in a word, the typhoid state is very marked. Commonly the patients are slightly jaundiced, particularly when the peritonitis is generalized.

As Hervieux has remarked, the appetite is often retained, but this is simply the result of "a perversion, not only of the functions of the stomach, but also of the brain." It makes no difference, however, for whatever is ingested is at once rejected.

These digestive disturbances are, we have seen, preceded by tympanites. This, indeed, is an early phenomenon, at times the initial. Curiously enough, however, the pain disappears as the tympanites and distension of the abdominal walls increase, to cease entirely when the meteorism has attained its maximum. Then even deep pressure fails to evoke sensation from this extraordinarily distended abdomen. While at the outset the pressure of a sheet caused the patient to cry out bitterly, now any pressure is borne without complaint, and this is one of the most unfavorable prognostic signs.

This excessive abdominal distension, by pressure on the diaphragm, induces respiratory troubles, and interferes with the action of the heart and the circulation in the great vessels. The respirations become short and frequent. It is not unusual to see them rise to 40, 50, 60 a minute, and thence arises the sensation of dyspnœa, of oppression, of which the patients complain, and the more or less cyanosed tint they present, like that of cholera patients in the algid stage. These respiratory troubles, however, are not purely mechanical. It is the rule, indeed, that women with peritonitis have also pleural and pulmonary complications, as well as cardiac affections. These complications, of course, aggravate the mechanical disturbances caused by the meteorism.

Remarkably enough the sensory disturbances are not at all proportionate to the grave state of the patients. Although at the beginning they complain of cephalalgia, this ordinarily disappears promptly, and the intellect remains up to the end. The appearance of delirium is an unfavorable sign, and this usually is the case twelve to forty-eight hours before death. It is rather, in the majority of instances, a low muttering delirium than an active one.

Side by side with these striking symptoms of puerperal peritonitis, we must note the alterations in the face. At the outset expressive above all of pain, the facies soon becomes thin, wrinkled, and assumes the hippocratic aspect. Later, prostration and coma deprive the face of all expression. Coma gradually deepens, all the faculties fade, the surface of the body becomes cold, livid.

As for the physiological phenomena of the puerperium, they are deeply disturbed The function of lactation does not become established, or else is abruptly checked if the peritonitis supervenes after its onset. Sometimes the lochia are suppressed after having been fœtid. The uterus does not involute. The patient is often covered with abundant, cold, clammy perspiration, and often there appear on the thighs, genitals, and buttocks, miliary vesicles, pustules, bullæ, at times petechiæ. Where the disease is prolonged, we may see bed-sores and gangrene of the genitals.

Course, Duration, Termination of Puerperal Peritonitis.—Only exceptionally does the inflammatory process invade at the outset the entire serous coat. Usually the hypogastric region is first affected, and only later does it reach the sub-umbilical region. At times, however, the course of the disease is very rapid, and in a few hours the process is generalized. The patients may die in three to four days. Again, the disease breaks out violently; then, either spontaneously or as the result of treatment, there occurs a remission, to be followed by a new outburst which continues to the end. Again, the disease follows a more regular course, and then it may terminate in death or in recovery. If it is to be death, the course of the phenomena is somewhat as follows: A violent chill followed by intense fever with great pain and tympanites. At first limited to the hypogastrium, this pain quickly invades the entire abdomen, and persists for twenty-four to forty-eight hours, sometimes longer. Then appear vomiting and diarrhœa. At the end of three to four days, at the furthest, the pain ceases, but the abdomen remains greatly distended, the pulse very frequent, the temperature very high, the general condition passes from bad to worse, the traits alter, the face becomes thin and drawn, the respiration more and more painful, the vomiting ceases entirely, or else returns but at infrequent intervals, but the diarrhœa persists, the stools become involuntary, delirium sets in, followed by coma and death. But few days are requisite for the enactment of this scene, the disease rarely extending beyond the seventh or eighth day.

In more exceptional instances, the disease develops rapidly with grave symptoms, and then in about forty-eight hours the patient seems better, when on the morrow, perhaps, the disease again resumes its acute course and persists till death.

Happily such is not always the case, and in rare instances, it is true, but they are often met with in private practice, recovery ensues. Sometimes the peritonitis is apparently aborted, but ordinarily the course of events is as follows: After an acute stage, the symptoms decrease in violence, the tympanites diminishes, and an indurated mass forms in the abdomen, filling it more or less, a mass constituted by the uterus and intestines agglutinated by false membrane, and which is felt through the *cul-de-sac*, even as in localized peritonitis. This mass will pass through the stages which we described under pelvic peritonitis. Sometimes, and this is the rule, it gradually is absorbed to disappear completely in from [illegible] abscesses form which open through the ab[illegible] bladder, or vagina.

[illegible] instances, the disease seems to transform or to merge into [illegible] we witness the disappearance of the abdominal symptoms, [illegible] still manifests its action by the onset of suppurative [illegible], erysipelas, pleurisy, etc.

[illegible] seen, is always very slow, and it is not very rare to see [illegible] the first peritoneal phenomena and succumb later, [illegible] by the morbid struggle they have made for so long. [illegible] is especially to be feared in cases where there is suppuration with opening into the viscera, the patients gradually yielding to [illegible].

[illegible] differential diagnosis of metritis from peritonitis is thus usually a [illegible] matter, and we resume the points as follows:

Metritis.	*Peritonitis.*
[illegible] constant, a general mod[illegible]	Chill always violent and prolonged, and renewed.
[illegible] moderate, except in grave [illegible] the pulse rarely exceeds 100, ex[illegible]	Fever intense, continuous, with acceleration of the pulse up to death. The pulse ranging from 116 to 120.
[illegible] between [illegible] and 103°; [illegible] this figure and rises [illegible] and lower.	Temperature very high, 103° at the lowest; often reaches 105° to 106°; presents no oscillations.
[illegible] localized over the uter[illegible] maximum sides laterally. [illegible] the broad liga[illegible] disappears [illegible] lasts a long [illegible] weight in [illegible] about one [illegible] the groin.	Pain constant, acute, spontaneous; invading progressively the abdomen from the hypogastrium. It lasts only a short time. Disappearance of pain does not mean amelioration in the condition.
[illegible] improves as the [illegible]	The general state may grow worse as the pain disappears.
[illegible] not altered, but on[illegible] during the fever.	Respiration anxious, difficult, frequent; dyspnœa; thoracic complications.
[illegible] limited to the [illegible]	Tympanites excessive, general.
[illegible] but slight. [illegible]	Great disturbance of the digestive tract, nausea, hiccough, incessant and profuse vomiting, persisting at times to death. Diarrhœa following on constipation. Tongue at first moist, then dry. Sordes.

Metritis.	*Peritonitis.*
Intellectual disorders *nil*, except in suppurative or gangrenous metritis, and then ultimate delirium.	Intellectual disturbances generally *nil* up to 24 hours before death; then delirium, coma, profound depression.
Facies scarcely changed except in grave cases. Icterus never present.	Profound change in facies, cyanosis; frequently jaundice.
Lochia fœtid, not entirely suppressed. Lactation incomplete. Arrest of involution.	Lochia usually suppressed. No lactation, arrest of involution.
To the touch, the uterus is large, painful, more or less immobilized.	Same characters, but more pronounced. Later, absolute immobility of uterus.
Recovery the rule. Complicated by peri- and parametritis. Lateral tumor ending in suppuration or absorption.	Death the rule. In case of recovery, enormous mass filling abdomen, resolving ordinarily in three to five months. Sometimes suppuration and death from hectic.
Death only in rare cases, such as in the suppurative or gangrenous forms.	Metastatic abscesses, arthritis, hepatic, pulmonary, cardiac complications, bed-sores, erysipelas, eruptions, &c.

III. PUTRID INFECTION.

We have stated that the puerperal affections, from a pathogenetic standpoint, may be due either to auto- or to hetero-infection. To the description of the former we now pass.

Putrid infection manifests itself nearly always under special conditions, that is to say, after miscarriages, incomplete third stage of labor, traumatism—in a word, where there has occurred putrid decomposition of any thing which has become foreign to and yet is retained in the genital passages. Here the general condition predominates over the local manifestations. These latter, indeed, are very insignificant. We are dealing with a true poisoning from resorption of putrid material. It matters little clinically whether this absorption takes place from the uterine wound, or by the lymphatics or the veins. The gravity of the case is dependent less on the nature than on the fact of poisoning. This poisoning does not always take place under the same conditions. At times it is slow, progressive, by small doses, so to speak, and again rapid and in large dose. At times we are certain of the presence of an infecting body in the genital canal. Again this body may be wanting, yet the patient present identical symptoms of putrid infection, without our being able to discover the cause of the poisoning. Whence, then, certain differences in the

three to five months; again, abscesses form whic[illegible] however,
domen, or into the rectum, bladder, or vagina.

In still rarer instances, the disease seems to [illegible] character of the
another, and we witness the disappearance of [illegible] and nothing
and the infection still manifests its action by [illegible] suppressed; it be-
arthritis, erysipelas, pleurisy, etc. [illegible] and the odor is

Recovery, it is seen, is always very slow, an[illegible] profuse, persistent,
the patients resist the first peritoneal phe[illegible] of the placenta and
worn out, as it were, by the morbid struggle [illegible] They are simply
Such a termination is especially to be feared [illegible] alone the bed, but
puration with opening into the viscera, the [illegible] It is particularly
hectic fever. [illegible] have been left in

The differential diagnosis of metritis fro[illegible] odor is characteristic
simple matter, and we resume the points a[illegible] once will recognize it
[illegible] the diseased puerpera.
[illegible] injections, it soon returns
[illegible] expelled, or removed *in*

Metritis.	
Chill not constant, in general moderate.	C[illegible] and [illegible]
Fever moderate, except in grave cases; the pulse rarely exceeds 100, except momentarily.	I[illegible] er[illegible] pul[illegible]
Temperature between 101° and 103°; sometimes exceeds this figure and rises to 104°, to fall quickly to 103° and lower.	lo[illegible] s[illegible]
Pain constant, localized over the uterus, with its maximum sites laterally, whence it spreads to the broad ligaments. Spontaneous pain disappears quickly, but provoked pain lasts a long time. The pain is dull, with weight in the loins. The elective site is about one inch above the fold of the groin.	tr[illegible] l[illegible] r[illegible] u[illegible]
The general state improves as the pain lessens.	
The respiration is not altered, but o[illegible] ly slightly accelerated during the feve[illegible]	
Tympanites slight, and limited to t[illegible] hypogastric region.	
Digestive disturbances but sl[illegible] The tongue lightly coated and moi[illegible]	

[illegible] error, but there are others
[illegible] and no tangible cause of
[illegible]ly completed; the labor
[illegible]: there exists no visible
[illegible] the fourth or the fifth day,
[illegible], the lochia are fœtid,
[illegible] which characterize putrid
[illegible] give no explanation of the
[illegible] patient's life.

[illegible]
[illegible] being intense and of long dura-
[illegible] frequently repeated chills,
[illegible] chill. There is often marked
[illegible] occur towards six or seven
[illegible] day, and are always followed
[illegible] temperature.
[illegible] pulse rate, usually oscillating be-
[illegible] evening rise. The fever in-
[illegible] pulse ranges between 96 and 120

does not exceed the latter figure, except just
temperature also may rise above 104°. There is
even when the patients feel better.
abdomen and the genital organs there is nothing
The uterus only exceptionally is slightly sensitive
involution, although retarded, is not arrested, and we
decrease in size, until it has sunk into the pelvis.
is nothing peculiar. The uterus is scarcely at all
culs-de-sac are free, the cervix is often patulous, es-
uterus contains a foreign body in a state of decomposi-
uterus is large, and a reddish fœtid discharge flows from
the discharge is profuse, containing dark clots, and the
into the cervix withdraws black stinking *débris*.
and body is large and the discharge profuse, the internal
finger may reach this body.
contains nothing, the cervix is shut, the organ involutes,
simply a more or less bloody discharge slightly fœtid.
bear in mind that flexion of the uterus may cause partial
tion of the lochia, and thence putrid infection. On exami-
may be closed, the organ not specially sensitive, and yet the
rge is fœtid, although not from retained placenta or secun-
patient may none the less be infected, however, and on
ng out the flexion bi-manually, the cause of the infection will
when more or less stinking lochia escape.—Ed.]

continued fever, fœtid lochia, and repeated chills, are joined a
general condition, and a facies markedly characteristic.
face has not that appearance of suffering which it presents in grave
and in peritonitis, but it has a tired worn-out look. The skin
dirty green tinge, it is moist, although the perspiration is not pro-
the patients complain of feeling tired, and of vague aches and pains;
object to the injections and the odors around them; they are thirsty,
e their appetite; the tongue is roughened and a trifle dry. Rarely
miting, usually only slight nausea is present. There exists persistent
nd fœtid diarrhœa. The abdomen is neither sensitive nor tympanitic.
What predominates, as we have said, is the general state without special
local manifestation. Each recurrence in rise of temperature is accompanied by more or less perspiration

If the patient resists the infection, and progresses towards recovery, either, the foreign body having been expelled *en masse*, the natural order of things returns, and in a few days she is convalescing; or else, the foreign body passing away in shreds, the lochia little by little lose their odor, the pulse lowers, the temperature diminishes, and recovery ensues more slowly.

Where, on the other hand, the woman is deeply infected and is going to die, she grows weaker and weaker. The diarrhœa cannot be checked, the perspiration becomes abundant, the temperature rises, the pulse exceeds 120, the face becomes pale and ashy, and in the final twenty-four hours, there is slight delirium, the coma passing insensibly, without much suffering, into death.

Although exceptionally putrid infection progresses rapidly, even as in gangrenous metritis, ordinarily the phenomena last from fifteen to thirty days and over. In a personal case of miscarriage at 3½ months the remnant of placenta was only expelled spontaneously at the end of thirty-seven days.

IV. Purulent Infection.—Pyemia.

Puerperal purulent infection is due to absolutely the same causes as surgical purulent infection, and the clinical phenomena and the pathological lesions are the same in the one as in the other.

In general, pyemia developes late in the course of the puerperium, towards the eighth or tenth day, sometimes later still. The instances where the disease has appeared earlier are exceptional. We have seen a case beginning on the third day after delivery. Ordinarily, the early days of the puerperium are normal and regular, the health of the puerpera being perfect, and there being apparent no lesion of the genital organs, or else a cicatrizing wound of the perineum. Of a sudden, without apparent cause, the woman has an intense chill, which may last from one half hour to a number of hours. Wunderlich has at times noted, immediately before the onset of the pyemic symptoms, a more or less great fall in temperature, and again he has seen slight rise of temperature. The chill, however, is followed by high temperature. The pulse rises to 130 and more pulsations in a few hours, and the temperature to 106° and even 107.5°. The temperature just as rapidly falls down even to 100°, and exceptionally below the normal. This chill and fever are followed by profuse perspiration, so that the bed-clothes are wringing wet, and this lasts until the temperature rises again. Sometimes a day or even two pass by with the woman in a fairly satisfactory condition, except that the pulse is rather rapid and the temperature slightly above the normal. Then suddenly the woman is seized with another violent chill, followed by the same rise in temperature and acceleration of the pulse. Similar attacks may follow for a number of days, and then the disease is pursuing its regular course.

Wunderlich thus describes the course of this disease:

1. Rapid rise of temperature, repeated without special regularity, even twice or thrice in the same day, the acme reached being nearly that of the first attack. Rapid fall of temperature immediately after each attack. Very seldom does the fever last for more than half the day at its maximum. The decline is to the normal or below, and exceptionally only to 102°.

2. Periods of apyrexia, lasting for twelve or even for twenty-four hours.

3. Usually, in the intervals of the febrile attacks, or else towards the end of the disease, there are periods of one or two days, where the temperature is continuous or remittent, with a tendency upwards, or else with no definite tendency at all.

After the attacks have thus occurred for a number of times in more or less rapid succession, the fever becomes continuous with evening exacerbations, and we witness the unfolding of the following series of phenomena.

The woman's skin becomes tinged yellow, which deepens shortly into the true jaundice hue; the uterus diminishes little by little in size; there is neither metritis, nor general nor circumscribed peritonitis; the lochial discharge is slightly suppressed, but at no time fœtid; and next appear the phenomena which are called metastatic.

Usually these metastases first affect the articulations. A vague, dull, and finally acute pain affects one or more joints. These swell, and run through the course of a purulent synovitis. At times the inflammatory process leaves one joint to affect another and definitively lodge there. Then abscesses are formed in the liver, the lungs, spleen, kidneys, rarely in the brain. At times the purulent collections are in the serous cavities, the pleura, the pericardium, the peritoneum. Endocarditis may occur.

The patients grow weaker, and die sooner or later from what may be termed a true purulent diathesis.

Here again the local affection seems insignificant. The uterine or peri-uterine lesions are masked by the general phenomena. Yet, post-mortem, in the great majority of instances, the veins and the lymphatics are found filled with pus, at the insertion site of the tubes and the broad ligaments. There has existed, then, phlebitis and lymphangitis, and these are the prime causes of the pyemia.

It is apparent, of course, how serious an affection of this nature is, and how rare recovery.

V. PUERPERAL SEPTICÆMIA.

In this affection there is nothing fixed or precise. Sometimes purely inflammatory accidents open the scene, and it looks as though we were dealing with one of the classic forms. The woman has a metritis, or a peritonitis, or is under purulent infection, and these affections apparently follow their ordinary course. Again, on the other hand, general phenomena predominate, the local troubles being relatively benign. But what characterizes this variety of puerperal infection, is particularly the peculiar mobility, so to speak, the variety and the multiplicity of the local manifestations. Sometimes the abdomen seems most affected, then the lungs, then the heart, then the brain, etc. Sometimes there will be no special, local manfestation, and these organs in succession will be affected, and the morbid phenomena will predominate more in one or in another, when, of a sudden, the disease will seem to affect still another organ hitherto untouched. In a word, it looks as though morbid raids were being made on all the organs without particular localization on any one. Elevation of temperature, however, is constant, and is proof that these local manifestations are not at all illusory, and that the entire body is profoundly affected. In case of septicæmia, indeed, we are no longer dealing with the particular forms we have passed in review. The evil is much greater if possible. Here the infection has attained its climax. Alteration in the blood is the capital phenomenon, and the various manifestations are purely outward signs of this true poisoning of the puerpera. The patients nearly always die, without our being able to say which of the morbid local manifestations was the cause of death.

[In his description of the different varieties of puerperal fever, Charpentier follows the example of nearly all ancient and modern writers, in making no reference to puerperal diphtheria as a special variety. The majority of clinical observers have indeed never seen a case of what they could term diphtheria of the genital passages of the puerpera, and we must rank ourselves with this great majority. Garrigues, of New York, however, is a firm believer in the existence of this special variety, and, having been fortunate enough to witness twenty-seven cases, he has given us a thorough description of the disease. He claims that there exists a variety of puerperal fever "distinctly limited by the appearance of a diphtheritic infiltration somewhere in the genital canal of puerperal women, seriously threatening the patient's life, tolerably well marked by other symptoms, and calling for the most energetic special treatment." The peculiar infiltration is thus described by him: "Of a light pearl-grey color, more exceptionally milk-white or sulphur-yellow, it makes its first appearance as discrete spots not larger than a millet-seed, but soon these spots extend in all directions and melt together, so as to form one or more large thick plates firmly adherent to, imbedded in, and, as it were, dovetailed with the subjacent tissue. The patches have commonly round contours, measure from one-eighth to one inch in diameter, and about one-eighth of an inch in thickness. All torn and abraded surfaces become more easily a prey to the diphtheritic infiltration, but I have repeatedly seen entirely healthy parts of the mucous membrane of the vagina, yet covered with epidermis and separated by intervening tissue from all tears and abrasions, become the seat of the affection. The parts surrounding the patches are more or less swollen, dark red, brown, or dirty green."

The symptomatology is not specially peculiar, but the signs of infection of the system precede the appearance of the infiltration for several days.

In one of Garrigues's cases where there existed "an unusual length of the period of formation of new patches, the same affection appeared simultaneously on the tongue." This he takes as strong corroboration of his opinion, that "this disease is identical with diphtheria as occurring on non-puerperal wounds, or as a primary disease without any wound, and most commonly localized in the throat, but found on all other mucous membranes."

Such is Garrigues's statement in regard to puerperal diphtheria. Coming as it does from such an eminently conscientious observer it is to be hoped that obstetricians generally will watch their cases, in order to corroborate what at the present day is still scarcely admitted as a justifiable addition to the varieties of puerperal fever. Lusk states the prevalent opinion as follows: "Whether these so-called diphtheritic patches are identical with those which appear in the throat is an open question. Morphologically they are so, but in hospitals, epidemics of puerperal diphtheritis are not associated with throat diphtheritis. Diphtheritic patches indicate an unwholesome atmospheric condition, and are somewhat rare outside of public institutions. Orth and Heiberg noticed the same general *post-mortem* changes in those cases in which the patches were absent as in those in which they were present. My own observations show that they are rarely developed in the early stages of a hospital epidemic of puerperal fever, nor are they to be found in all cases when such an epidemic is at its height."

It is noteworthy that all of Garrigues's cases occurred in a hospital, and in all of them the symptomatology was no different from that which we are accustomed to find in other varieties of puerperal fever. It is the local lesion, the patch, which constitutes the differential factor, and we do not think that either he or other observers have proved the identity of this patch with that which is found in the pharynx of patients suffering from diphtheria.

As to whether then there exists a variety of puerperal fever to which the distinctive name puerperal diphtheria may be applied, must still remain an open question.—Ed.]

VI. Phlegmasia Alba Dolens.

This affection has been variously considered as due to a milk metastasis, as a disease of the lymphatic system, a rheumatic, or renal manifestation, a phlebitis, and by Virchow as the result of a physiological thrombosis. To-day it is believed to be a phlebitis, but of a peculiar kind. In the vast majority of cases it is followed by recovery.

It is a late accident of the puerperium, and rarely appears before the twelfth to the fourteenth day, often later, and although at times it apparently follows on pelvic or abdominal affections, most frequently it is primary, overtaking the woman at a time when she believes herself out of all possible danger. We have seen three cases where it did not appear till the twenty-first to the twenty-fifth day.

Hervieux mentions a sort of prodromic period, characterized by repeated chills, general malaise, more or less intense fever, anorexia, disquietude. We have never noted it, and in our experience the affection always developes suddenly.

The first symptom is pain, either at the outset faint and heavy and slowly becoming acute, or else acute from the start. Sometimes this pain first appears in the popliteal region, sometimes in the groin, often at the ankle, and then progressively invades the entire limb, either ascending or descending. By following the line of the pain it is found to correspond to the deep vessels of the limb, and frequently a hard cord is to be felt, even at the outset, corresponding to the inflamed vein. The inflammation of the vein is all the more pronounced to the touch the less in degree the swelling, which shortly sets in. The vein, in any event, can always be felt either in the popliteal space, or in the groin. The pain is aggravated by motion.

The edematous swelling of the limb is either slight or enormous. The limb may double in size, and it pits on pressure. The skin is tense, shiny as though transparent, and often looks as if it were the seat of a true reticular lymphangitis. At the same time slight fever appears, usually not preceded by a chill, but only by chilly sensations.

Ordinarily, the edema stops at the root of the leg, but it may extend to the hypogastrium. We have seen an example in a case of double phlegmasia. It is not rare to find the phlegmasia invading both the lower limbs. Usually the second limb is seized when the process is on the point of disappearing from the first, although not infrequently both limbs may be affected at the same time, in the one limb the process being a trifle in advance of that in the other. In one of our serious cases the edema extended successively from below upward to the groin of the left leg, thence to the hypogastrium, thence to the groin of the right leg and down it. In this case then the edema followed an ascending course in the left leg, and a descending in the right, and for five to six days there was present in addition great depression and high fever, which made us anxious lest grave complications were going to set in. The patient, however, made a slow recovery. She has since been confined twice; in her second labor she had a slight phlebitis in one leg; in her third the phlegmasia reappeared on the twenty-third day, invaded both limbs, and disappeared only at the end of many months.

Recurrence, indeed, is very frequent at succeeding confinements, but in general, the phlebitis becomes more benign each time. The duration of the affection is very variable. Ordinarily the fever lasts only twelve to fifteen days, in mild cases, and the pain persists to a greater or less degree during the entire febrile state. As the latter disappears so does the pain. It is exceptional for the edema to vanish before the third week. Often it lasts for a long time, even for months or years, thus interfering considerably with walking. In one of our patients it was only after the lapse of two years that the limb regained its integrity.

In the vast majority of instances the disease ends in cure, although a number of cases of death have been recorded. Death, when it occurs, results either from suppuration of the vein and consecutive purulent infection, or else a clot is detached and the patient dies of embolism. The end is slow in the first instance, and very sudden, or nearly so, in the second.

Finally, in certain cases phlebitis is complicated by periphlebitis, a true phlegmonous inflammation of the leg and the thigh. We recently saw an instance after miscarriage at four months.

VII. Sudden Death in the Puerperal State.

Although puerperal affections ordinarily manifest themselves under one or another of the forms which we have described, it is not always so, and it suffices to refer to the descriptions given of puerperal fever by the older writers, and to the history of different epidemics, to see what diverse forms puerperal accidents may assume. Here it is phlebitis, there it is lymphangitis, here pleurisy, there scarlatina, which dominates the pathological scene, and Hervieux's work contains the enumeration of all the diseases which may affect the puerpera. But all these diseases, in order to lead to death, require a certain interval, pass through certain stages, give the accoucheur, in a word, a chance to fight, to test his drugs, in order to release the woman, if he can, from the danger threatening, and in many instances he is successful. There is, however, a further accident which threatens the puerperal woman and against which the physician is impotent, for it comes like a thief in the night in the majority of instances, and it carries off the woman with a rapidity which is appalling. This is *sudden death.*

Mentioned for the first time by Dionis, in 1718, by Delamotte, 1766; and later by Ramsbotham, 1814, McClintock, 1853, and studied with care by Mordet and Moynier in 1858, sudden death of the puerpera has since been the subject of numerous monographs, and each author, while admitting the occurrence, has given a different explanation, and each, basing his deductions on the cases he has seen, has interpreted it after a different manner, some attributing death to a lesion of the circulatory system, others to a lesion of the nervous system, of the respiratory system, others still to syncope, to puerperal poisoning, and finally, like Coste, almost exclusively to myocarditis.

We cannot discuss all the known cases, but we desire at the outset to mention the following conclusions:

1. Death is rarely sudden in the exact sense of the word. Usually it occurs after the lapse of a few hours. That is to say, we are not dealing generally with lightning-like death, such as follows rupture of the heart for instance; and it is possible from a careful examination of the predominating symptoms, to determine that the cause resides in one of the three organs, which Bichat has called *the vital tripod,* the heart, the lungs, the brain.

2. As Hervieux remarks, it is ordinarily during deadly puerperal epidemics that sudden death is met with, and, therefore, he was led to seek in puerperal poisoning the most active and frequent cause of sudden death, and he makes a distinction between cases where death is prompt, and those where it is sudden in reality. "It is especially in case of prompt death that autopsy has revealed an appreciable lesion; under the term sudden death are to be classed all those cases where, *post-mortem,* no alteration competent to explain the fatal issue has been found."

Coste, from a study of the majority of the reported cases, has reached the following conclusion: "Sudden death after delivery is due: either to hemorrhage, either to a thrombus in the pulmonary artery, or to myocarditis. Since hemorrhage results in more or less rapid death, and since, on the other hand, pulmonary thrombosis appears to be due to a degeneration of the myocardium, we may conclude that sudden death is always due, after labor, to a myocarditis."

This conclusion seems to us at least premature, for, as is seen, Coste admits that the death may be *more or less rapid,* and he enters into the field of speculation when he says: "Myocarditis arising during gestation may cause sudden death in the first week following delivery, while from the form which occurs in the course of puerperal fever, death only results in the second week or even during convalescence."

Every case of sudden death is not, in truth, preceded by affections occurring during pregnancy or the puerperium, and although in many instances we may find the cause after death, in many others there have been no disturbances of any kind during pregnancy or the puerperal state, and yet death occurs with absolute suddenness, without any premonition whatsoever. These instances are exceptional, and we are here in the presence of an as yet unknown factor which the future may reveal, but which, in the present, calls for prudent reserve in expression of opinion.

Theories aside, we must to-day accept the classic division, and say that in the vast majority of cases death results under the following conditions:

1. *Lesions of the circulatory system:* a. *Lesions of the heart or of its envelopes; alteration in the valves; myocarditis*; *hydatid cysts* of the septum of the heart; *pericarditis; rupture of the heart.* In this subdivision belong the cases of P. Dubois, MacCorvan, Corvisart, Hervieux, Depaul, McClintock, McNichol, Spiegelberg, Simpson, Despeaux, Ader, Peleyo, Danyau, Coste, etc.

b. *Hemorrhages.*—The cases of Elsasser, Lachapelle, Dubois, Quesnel, Johnson, Matice, Zenker, Besniers, Ollivier d'Angers, Hervieux. In all these cases death has been rapid, but not sudden, in the true sense of the word.

c. *Thrombosis of the Pulmonary Artery.* Cases of Dionis, McClintock, Hervieux, Gosselin, Prestat, Hawer, Charcot and Ball, Hoogeweg, Simpson, Pajot, Jacquemet, Playfair, Peter.

d. *Presence of Air in the Heart and the large Vessels.*—Lachapelle, Baudelocque, Lionnet, Bessens, Olshausen, Litzmann, Depaul, Berry, Leven, Smith, Walford, Schroeder, Hervieux, etc.

2. *Lesions of the Respiratory System* (congestion, pulmonary apoplexy, pleurisy, pleuro-pneumonia).—Cases of Mordret, Moynier, Charpentier, Delamotte, Campbell, Devilliers, Verrier, Ollivier d'Angers.

3. *Lesions of the Nervous Centres* (hemorrhage, traumatic shock, moral emotions).—Cases of Menière, Schedel, Lachapelle, Moynier, Mordret, Villeneuve (Marseilles), Méritan, Blum, Playfair, Burdel, Travers, Morgagne, Robert, McClintock.

4. *Puerperal Poisoning, Septicæmia.*—Hervieux, Lachapelle, Dubois, Keith, Challier, Schroeder, Larrey, Méritan, Charpentier (two cases.)

5. *Acute Myocarditis.*—Coste.

Such are the usual causes of sudden death in the puerperium. In many instances, it is apparent, there existed a lesion which predisposed to this sudden end, and from this standpoint phlegmasia alba dolens, by causing the formation of a thrombus in the crural vein, should hold the first place. Happily this fatal sudden termination is rare, and must be considered exceptional.

As for the belief that the property of the blood of puerperal women of coagulating spontaneously plays a part, for our part we would reject it absolutely, for since this property exists in all puerperal women, we should be astonished not at the accident, but at the infrequency with which it occurs.

CHAPTER III.

PATHOLOGICAL ANATOMY.

SINCE it is granted to-day that puerperal accidents are the result of the penetration into the organism of an infectious germ, in other words that they are due to a true sepsis, it is not necessary any longer to describe in detail the different lesions which may be met with *post-mortem*. Such lesions always exist, are so to speak innumerable, and there is not a single one which may not be met with. Although cases have been reported where no lesion whatsoever was found, these instances daily become more and more exceptional, and, as Playfair well says: "In such cases even the olden-time rough methods of examination will reveal some alteration in the blood, and ecchymoses in the lungs, the spleen, the kidneys, etc. Recently it has been shown that, besides beginning inflammation in most of the tissues, such as cloudy swelling, there exists granular infiltration and disorganization of the cellular elements. This is proof that the blood, impregnated strongly with septic material, has carried everywhere the morbid germ, which had not the time to develop before the patient's death."

This morbid germ, we have seen, has been demonstrated by Mayrhofer, Waldeyer, Recklinghausen, Heiberg, Orth, Birsch-Hirschfeld, Spillmann, Kehrer, Miller, Hausmann, Quinquaud, Despine, etc., but to Pasteur and his pupils belongs the honor of isolating this germ, of cultivating it, of reproducing it, according to the manner of culture, in determinate forms; of establishing, in a word, in puerperal septicæmia, germ-varieties and shapes corresponding to the degree of development of the germ.

According to Pasteur and Doleris, two sorts of organisms preside over infection:

1. The cylindrical septic bacteria, which induces rapid septicæmia.
2. The micrococcus which begins as a point and then is harmless; later forms in couples and determines suppuration; later still assumes the form of *chapelet de grain*, and causes the attenuated variety of septicæmia.

One capital point, according to them, dominates the entire pathological anatomy of puerperal fever: "This is the constant presence of microbes with a determinate pathological transformation."

The microbe exists, a number of routes are open by which it may penetrate into the organism, and once it has gained access, we witness the development of the most varied and complex pathological manifestations. All the necessary conditions for the production of puerperal accidents are present: vulvar, perineal, vaginal lesions, uterine wound, on the surface of which open the lymphatics and veins in great number, each forming a route by which the infectious germ may reach the organism and thence be spread by the blood and the lymph to produce the varied secondary lesions which are observed in these patients.

We must hence study in succession, even as do Doleris and Raymond:

1. The lesions which may be met within the utero-vagino-vulvar canal.
2. The lesions in the veins, lymphatics, cellular tissue, the channels of diffusion.
3. The resultant secondary lesions.
4. The vehicles of the poison (blood and lymph.)

1. Almost all authorities seek the source of infection in the uterine wound (placental site.) We believe with Schroeder, Spiegelberg, and others, that the wounds of the vulva, of the vagina, and especially those of the cervix, are at least as often the starting-point of infection, and this explains the unquestionable greater frequency of puerperal septicæmia in primiparæ over multiparæ.

The wounds, in case of puerperal infection, usually have an unhealthy look, and are often transformed, especially at the introitus vaginæ, into a species of ulceration which the Germans call puerperal ulceration. The margins are tumefied, the base covered with a dirty yellow deposit, which separates only at the end of a number of days. In certain instances these ulcerations have a tendency to spread, at times having a true gangrenous appearance, and they are associated with much edematous infiltration of the neighboring tissues. When they are extensive, the labia majora are livid-red, tumefied, edematous, and it is not rare to witness true gangrene of the vulva and vagina, extending to the cervix, and even within the uterus. Virchow has given these appearances the name of malignant internal puerperal erysipelas, but we are not dealing with a true erysipelas, there being simply inflammation of the neighboring cellular tissue. In other instances, the wound looks diphtheritic, or at least it has the same appearance as that seen in surgical diphtheritis. When the lesion invades the vagina, we have puerperal vaginitis; higher still, and we have puerperal metritis. Occasionally, only the mucous membrane is affected, and then there exists an endometritis, the organ being soft, slightly infiltrated, sub-involuted, although its muscularis remains sound. The inflammation may thence extend to the tubes and give rise to a salpingitis, which in turn may set up puerperal peritonitis. But this form, as we will see, is more frequently determined by another process.

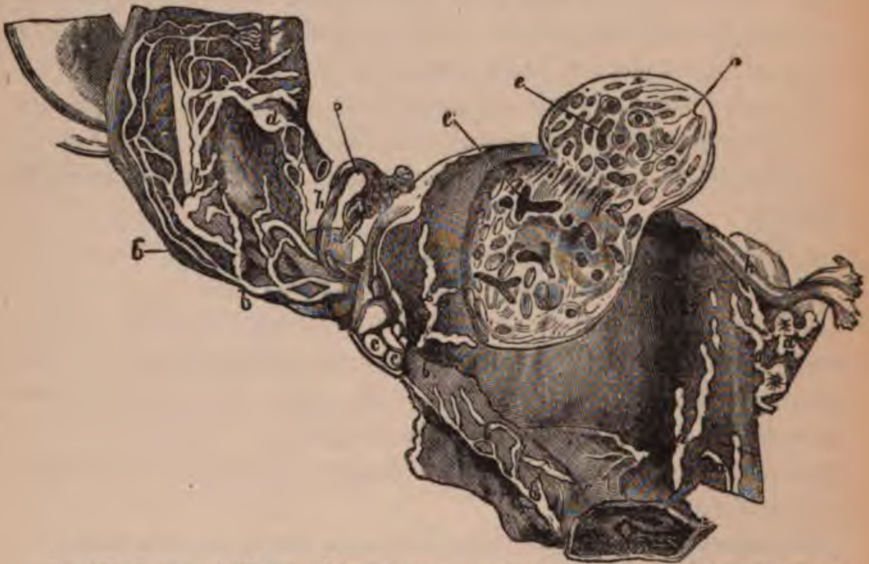

FIG. 187.—PUERPERAL UTERINE LYMPHANGITIS.—*aa*, Purulent lymphatics projecting through the peritoneum. *bb*, Open lymphatics, peritoneum removed. *ccc*, Inflamed lymphatics with thrombi. *d*, Intact, open vein. *f*, Section of left tube filled with pus. *gg*, Ovary enlarged, and covered with purulent exudation.

Again, the lesions may be more accentuated and deeper, and we have no longer a simple endometritis. The mucous membrane, altered, transformed into a species of reddish slough covering the internal surface of the uterus, presents, here and there, especially at the placental site, gangrenous vegetations, diphtheritic patches; whence the names gangrenous, diphtheritic endometritis. In such instances, the parenchyma of the uterus appears to participate in the lesion, and in places seems to have suffered gangrene, but, as Raymond and Spiegelberg have shown, this interpretation is not the correct one. What has been described under the name *putrescence* of the uterus, is simply phlebitis and lymphangitis of the net-work. (Fig. 187.) The uterine tissue is soft, full of serum, its vessels are empty or nearly so, a few of the larger veins alone contain clots. The muscularis itself is only exceptionally affected. It is in the connective tissue that the inflammatory changes are found. The abscesses of the uterine tissue, described by certain authors, are simply ectasic veins or lymphatics filled with pus. The affection is a *metro-lymphangitis* or a *metro-phlebitis*. When sections of the uterus are made, the sero-purulent infiltration of the connective tissue is found to occupy points of election, so to speak, in particular the borders of the uterus where the broad ligaments are attached, and where the blood and lymphatic vessels enter and emerge. Often, at these points, the peritoneum is lifted up by vessels distended with pus, vessels projecting greatly like a bird's feather, and which are due to ectases of these vessels, in particular the lymphatics. The pus is most certainly found at the superior angles of the uterus where the tubes insert, and thence these lymphatics, filled with pus, extend into the plexuses of the broad ligaments, and this explains the frequency with which peri- and parametritis complicate metritis.

In other instances the veins are more particularly affected. There exists a metro-phlebitis, and then it is especially at the placental site that the lesions are found. The thrombosed veins are filled with pus, and projecting, simulate abscesses of the uterine tissue, thus misleading the superficial observer.

2. The blood-vessels and the lymphatics are the channels by which the infectious germ are carried; and long before the direct presence of the micrococcus had been determined in them, authorities had laid stress on the capital *rôle* which these vessels played in the puerperal drama. The two theories of phlebitis and of lymphangitis have for long divided accoucheurs, and it will suffice to recall the works of Dance, of Béhier, of Hervieux, on phlebitis; those of Tonnelé, Cruveilhier, Championnière, Siredey, Augé, etc., on lymphangitis. From the writings of the three last, in particular, it is apparent that, although phlebitis does exist, it is infinitely rarer than lymphangitis, and Leopold's researches on the uterine mucosa and the lymphatics of the uterus explain readily the rapidity and intensity of the propagation of the morbid process. The uterus represents indeed a vast lymphatic gland, the mucous membrane being perforated,

riddled, by lymph sinuses, whence the lymph vessels arise. The lesions, finally, are about the same, whether it is the veins or the lymph vessels which are affected:

"The first phenomenon which occurs in the veins of the uterus after delivery is coagulation of the blood, thrombosis, which, according to the investigations of Leopold, begins even before the third stage of labor, a thrombosis which normally is limited to the uterine sinuses, but which may extend further, pass out of the uterus to the utero-ovarian plexus, the large venous trunks and even the limbs. If this coagulated blood contains infectious germs, inflammation of the walls of the vein sets in, the thrombus degenerates and the micrococcus appears in the shape of fine grains, like sand, infiltrating the vascular wall, lifting it upward, and sowing little miliary and sub-miliary nodules. (Doleris.) But, according to Doleris, the suppuration, or rather the cause of the suppuration of the clot, is in the blood, and not in the wound. What happens, in fact? Pus is rarely found in the veins of the uterus, but the first traces are met with in the utero-ovarian plexus, in the veins in the neighborhood of the ovary, those which dip into the medullary layer. We may even find a large open trunk, closed by a clot, and spreading out in a putrid cavity, the remnant of the stroma of the ovary. (Fig. 188.)

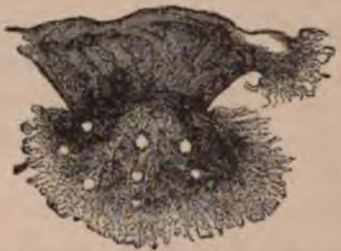

FIG. 188.—DISEASED OVARY IN PUERPERAL FEVER.

"The centre of the clot is always in a state of suppuration, which makes me think that these successive purulent layers in the coagulum are due to equally successive depositions of micrococci coming from the blood. Their presence in considerable quantity causes inflammation above the stopping-place of the pre-existing phlebitis, and at a variable height. Next, the deposition of fibrin for a time interferes with the development of the micrococcus, seeing that it is shut up, as it were, in the fibrinous masses. Later, the embolus is detached; then follows the infarctus with its varieties, suppurative if the embolus is purely pyogenic, and putrid if the embolus is septic.

"These lesions of the veins may, however, occur after another fashion, secondarily, so to speak, to a lymphangitis. When the latter exists in the large vessels, the micrococcus within them travels slowly, and, being in contact with the venous trunks, determines periphlebitis and periphlebitic abscesses. The vein, the artery, the lymphatic vessels are then enveloped in a more or less dense mass, in which are found small foci of suppuration, either around a veinlet or within it. We have thus successively a lymphangitis, periphlebitis, phlebitis, and later pyemia, purulent infection.

"If the main lesions are rather in the lymphatics, they are caused, similarly, by the penetration of the infectious germ. This invades at the same time the lymphatics of the uterus, and those below the peritoneum. These vessels inflame, and the angioleucitis spreading by continuity of the serous membranes and the cellular tissue, we witness the production of what may be called the secondary lesions, pelvic peritonitis, adenitis, pelvic cellulitis, pleurisy, meningitis, arthritis of the pelvis, and finally every one of the distant metastatic lymphangitides. We may thus follow step by step, so to speak, the progress of the disease.

"It seems, then, to result from a study of these facts that, as Doleris says, the inflammation of the lymphatics is the first factor; that the inflammatory process then spreads to the blood-vessels by way of the thoracic duct oftener than by other peripheral channels, by reason of the obstacle offered by the ganglia, and that finally, it may appear at distant points, owing to the connection of the serous net-work with the capillaries."

Whether it be desired to make septicæmia and ichoremia different varieties of puerperal infection, matters not; the capital, essential point is the hematic lesion, and this is constant, although not always identical, and hence differences in the views held by a number of authorities.

While Hersent, Vogel, Laurent de Fresnel, claim that there is slight diminution in the fibrin and in the albumin, with increase in the water and decrease in the globules, Gautier insists on the almost constant deformity of these globules. The blood, further, contains an excess of urea and of carbonic dioxide, and even of glucose and of free hydrogen. The albumin is diminished, and often lactic acid is present. Fouassier grants the diminution of the red globules and the increase in the white. Finally, Colz and Feltz, Spillmann and Heiberg, Pasteur and Doleris, note in the blood a considerable quantity of microbes. Doleris goes even further and tries, with Pasteur, to class these microbes.

"Are we dealing with true, lightning-like septicæmia? Then the blood, heavy, semi-coagulated, in appearance like badly cooked gooseberry-jelly, sometimes blackish, presents an extreme alteration of the corpuscles. They are deprived largely of their hemoglobulin, which is much below the normal. There is no special increase in leucocytes. The microbe does not appear in the blood till late in the disease, sometimes only after death. It is made up of elongated elements, thin, cylindrical, moving in the tissues and penetrating into the lymphatics, and to the peritoneum.

"These are the septic bacteria.

"In order that this form may appear, the septic bacterium of Pasteur, the microbe in rods, must find an appropriate medium. There must exist *anoxemia*, lack of oxygen, since these bacteria cannot develop in oxygen. There must exist a generative focus outside the blood, and this is supplied by the lymphatic system. But in order that the lesion may assume the suppurative form, there must be added to the bacterium a special microbe, the mocrococcus in double points.

"Are we dealing with attenuated septicæmia? The alteration in the blood there takes place more slowly, and it occurs, according to Doleris, from the presence of a special organism, which may be fairly called specific. It is the micrococcus in chaplets. It passes from the lymphatics into the blood continuously, without determining any lesion other than a more or less profound change in the corpuscles. Under the influence of the coccus the corpuscles become decolorized, crenated, segmented, and the hematin almost entirely disappears.

"The nature of the organism, then, differs in the two instances.

"When the lymphatic lesion coexists and developes progressively, culture of the micrococcus of the blood gives rise almost constantly to long chaplets, sometimes to cylindrical bacteria.

"When the blood lesion exists alone, culture only gives rise to micrococci in colonies, in irregular groups or in couples, which never arrive at the advanced stage of chaplets, possibly owing to their sojourn in the blood.

"When the hematic lesion is accompanied by phlebitis, infarctus, the almost constant form is the single point in couples. Culture reproduces it in enormous quantities, to such a degree, indeed, that it looks as though we had made an artificial pus."

3. *Secondary Lesions.*—To pass now rapidly in review the alterations found in different organs in the body, we find the following modifications:

In peritonitis, the peritoneum is greatly injected, and the abdominal organs are bound together by false membranes to form depressions in which accumulates thick serum or pus, usually in considerable amount. In the pleura the same inflammatory signs are found, and either effusion in or adhesion of the pericardium. The endocardium is injected, with ecchymoses, ulcerations, vegetations, and there are even changes in the tissue of the heart itself.

In the lungs are found congestion, œdema, embolic infarcti, abscess, lobar and lobular pneumonia, sometimes gangrene.

In the brain, alterations to a greater or less degree of the meninges, suppuration, exudation.

In the joints, collections of fluid varying from serous to purulent.

The spleen is enlarged, soft, the color of chocolate, and is filled with abscesses. The liver contains abscesses, every stage of acute yellow atrophy, fatty degeneration more or less accentuated. The kidneys offer degenerative changes, sometimes limited to the cortex, extending even to the destruction of the epithelium of the canaliculi, or of the canaliculi themselves, emboli, abscesses, etc. The pancreas, parotids, mammæ, the thyroid, may be affected and riddled with abscesses the result of emboli.

The ganglia, the cellular tissue, the muscles, may be the seat of greater or less suppuration. The intestinal canal, the bladder, the rectum may be inflamed, ulcerated or not. Finally, the skin may be the seat of eruptions, pustules, gangrene, etc. In a word, we may meet every possible lesion, these varying according to the different forms of the disease.

Finally, together with phlebitis and lymphangitis, Simpson has described an arteritis and arterial obstructions which are the consequences. (Fig. 189.)

In case the inflammatory form predominates, it is in the uterus and its annexa, and in the peritoneum, that the most accentuated lesions are found.

In case the purulent form is in the foreground, phlebitis, with metastatic abscesses, is the marked lesion.

In case septicæmia, pure or attenuated, is present, lymphangitis is the chief vascular lesion, associated with lesions of one or another organ, without any special characterisation of the disease.

According, in a word, to the degree of infection and the resisting power of the individual, the effects of infection will tell to a greater or less degree on the economy; and while in one case only metritis or peritonitis will be found, in another almost all the organs will be to a greater or less degree affected, and the morbid process may, so to speak, be followed step by step.

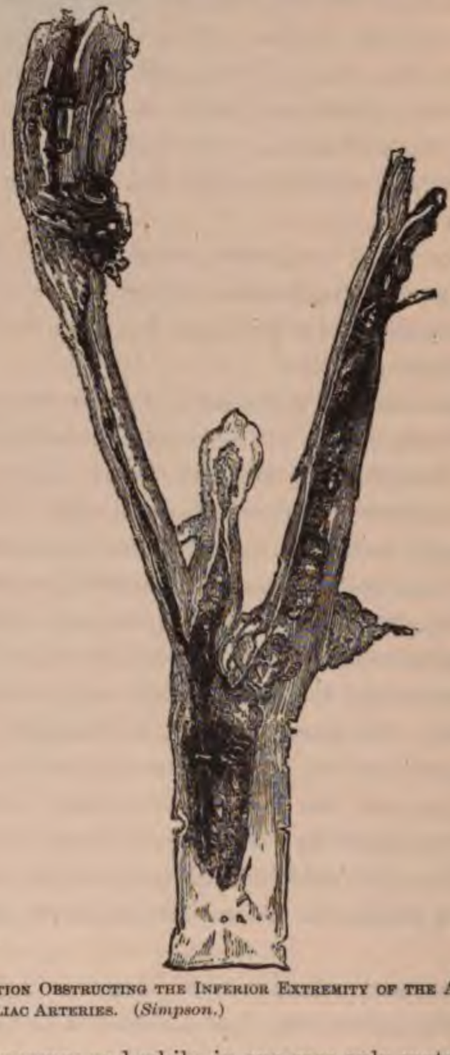

FIG. 189.—VEGETATION OBSTRUCTING THE INFERIOR EXTREMITY OF THE AORTA, AND EXTENDING INTO THE PRIMITIVE ILIAC ARTERIES. (*Simpson.*)

CHAPTER IV.

PROGNOSIS.

WHEN the puerperium is regular and physiological, the patients, we have seen, have no fever, not even on the establishment of lactation, but possess, on the contrary, a slower pulse, and a temperature which does not exceed 100° or at most 101°. Whenever then we find rise of temperature in a puerpera, we ought to be anxious lest some grave complication is going to develop, and give a guarded prognosis. Although, indeed, the purely inflammatory affections almost always terminate in recovery, the same does not hold true of those which are dependent on infection, and although putrid infection often ends favorably, it is far otherwise with peritonitis, the purulent and gangrenous metritides, purulent infection and septicæmia, in which death is almost constantly the rule. We must, however, here draw a wide distinction between the cases which occur in private practice, and those which arise in maternity hospitals. As long ago as 1858 Tarnier showed that the mortality at the Paris Maternity was 1 in 19, while in the twelfth ward of the same city it was only 1 in 322. In 1861, Husson reported that the mortality in Paris was 1 in 172 outside of hospitals, while in them, taken collectively, it was 1 in 10. In 1866, Lefort, comparing the mortality rate in general of maternities and of cities, gave the following figures:

Maternities and hospitals, 888,312 confinements, with 30,594 deaths; cities, 934,781 confinements, with 4,405 deaths, that is to say, in maternities and hospitals 1 woman died in 29; in cities 1 in 212. Lefort was, therefore, justified in drawing the following conclusion: The mortality of women delivered in hospitals and maternities is out of all proportion to that of those delivered in cities. To explain these facts, the following influences have been stated as being effective: the influence of the hospital, the social state and the morals of the women confined there, and the afflux into the hospital of the grave cases which can not be terminated in town. These are not the true causes, but rather the overcrowding in hospitals, and above all contagion—a contagion the more likely to disseminate the greater the crowding, and which may even result in an epidemic.

Latterly, happily, these views in regard to contagion have become classic, and the means taken by accoucheurs in charge of maternity services have considerably reduced the mortality rates. We content ourselves with citing the figures given by Beurmann, from the statistics of the Lariboisière and Cochin hospital.

At the Lariboisière hospital, Siredey takes two chief precautionary measures: The one aims at purifying the surroundings of the lying-in woman; the other aims at cleansing from morbid germ those who are in attendance on the puerpera.

A study of the following tables shows the proportionate decrease in the mortality rate:

Years.	Total number of labors.	Total number of deaths.	General mortality calculated on a basis of 10 deaths to 100 deliveries.	Number of deaths from puerperal causes.	Puerperal mortality, on basis of 10 deaths to 100.	Number of deaths following simple labor.	Mortality after similar labors, on basis of 10 to 100.
1854	46	1					
1855	467	45	9.6%	39	8.4%		
1856	522	33	6.3%	29	5.6%		
1857	708	39	5.5%	37	5.2%		
1858	593	44	7.4%	42	7.1%		
1859	776	64	8.2%	61	7.9%		
1860	652	49	7.7%	47	7.2%		
1861	732	47	6.4%	45	6.1%		
1862	716	24	3.4%	20	2.8%		
1863	876	24	2.7%	18	2.1%		
1864	919	46	5.0%	39	4.3%		
1865	960	22	2.3%	5	.5%		
1866	813	19	2.4%	10	1.2%		
1867	959	15	1.6%	12	1.2%		
1868	1,091	20	1.8%	17	1.5%		
1869	1,034	21	2.0%	19	1.8%		
1870	944	24	2.5%	20	2.1%		
1871	723	27	3.7%	24	3.3%		
1872	896	31	3.4%	30	3.3%	25	2.9%
1873	947	34	3.6%	28	3.0%	17	1.8%
1874	848	18	2.1%	16	1.9%	9	1.1%
1875	897	18	2.0%	14	1.6%	8	.9%
1876	899	25	2.8%	17	1.9%	13	1.5%
1877	893	25	2.8%	14	1.6%	6	.7%
1878	890	17	1.9%	10	.9%	5	.5%

Deaths of Women Delivered outside and brought into the Hospital after Several Days.

Years.	Total number of deaths.	Deaths from accidental causes.	Years.	Total number of deaths.	Deaths from accidental causes.
1854	6	1	1867	3	1
1855	3	1	1868	13	1
1856	6		1869	6	
1857	11		1870	17	2
1858	5		1871	11	
1859	9	1	1872	12	
1860	20		1873	13	
1861	23		1874	17	2
1862	26	2	1875	10	
1863	19		1876	15	
1864	23		1877	9	
1865	4		1878	4	
1866	4	1			

On the other hand, Polaillon, who is a resolute partisan of the antiseptic method, and has used it at the Cochin hospital, has obtained the following figures:

Years.	Number of deliveries.	Total deaths.	Proportionate mortality.	Puerperal deaths.	Puerperal proportionate mortality.	Deaths after simple labors.	Mortality proportion after simple labor.
1873	713	4	1 in 178.2	4	1 in 178.2	2	1 in 355.5
1874	609	11	1 in 63.5	9	1 in 77.5	7	1 in 99.3
1875	739	5	1 in 147.8	3	1 in 245.7	2	1 in 369.
1876	738	9	1 in 82.	6	1 in 125.5	5	1 in 146.8
1877	808	5	1 in 171.6	1	1 in 807.		

To resume: In five years at the Cochin hospital there were 3,697 labors with 34 deaths, of which 23 were from puerperal causes after simple or complicated labors, or 1 in 160.3, and 16 after simple labors, or 1 in 229.9. Multiparæ 1 death in 97 labors; primiparæ 1 death in 119 labors.

Finally, in 1878, Championnière, at the same hospital, had 770 confinements, with 5 deaths, 2 of which were from puerperal causes, and 3 from accidental causes (phthisis, acute pericarditis, eclampsia), a puerperal mortality of .232 per cent.

In 1879, there were 685 confinements with 11 deaths. Of these 11, 3 were brought to the hospital with rupture of the uterus, 1 dying of eclampsia, 1 tubercular; in reality then, 6 deaths from the fact of labor, or .85 per cent., a figure which he claims may be reduced to .41 per cent.

[Statistics from other institutions might be added, all going to prove that year by year the mortality rate from puerperal causes is being lowered.

C. Braün has recently published the statistics of his lying-in wards during the past twenty-nine years. From 1863 to 1880 the mortality percentage was 13 per 1000, and from 1881 to 1885 only 4 per thousand.

Lusk, of New York, and Richardson, of Boston, report equally favorable results in the institutions with which they are connected. The former, in 1885, recorded his belief that "a woman is safer who comes into our Emergency Hospital than her more fortunate sisters in the elegant parts of our city." Garrigues gives the following data from the records of the New York Maternity hospital:

Years.	No. of Deliveries.	Deaths.	Per cent.
1875,	570	15	2.63
1876,	536	20	3.73
1877,	480	32	6.67
1878,	255	7	2.75
1879,	254	11	4.33
1880,	149	8	5.37
1881,	382	9	2.36
1882,	431	14	3.25
1883,	447	30	6.71
1884 to October, 1886,	1430	14[1]	.98[1]

Hirst, of Philadelphia, states that the total number of women delivered in institutions in the United States, during 1880—1885, was 19,902, with 516 deaths, or 2.59 per cent.

Parvin is authority for the statement that at Munich, Winckel has reduced his mortality rate to about .5 per cent. Fritsch states that in Berlin the mortality has been reduced (in Gusserow's service) to .9 per cent.; at Strasburg to .27 per cent. In Breisky's clinic 527 women have been delivered with but one death, and Fritsch has recorded 300 deliveries with no deaths.

Further statistics which we might collate would simply bear out the broad truth which we desire to emphasise, which is that each year gives promise of better results in the future, so that we are justified in looking forward to the day when no woman will perform the physiological function of labor with any more risk than she performs other physiological functions. Mortality from puerperal causes can be lowered to *nil,* for such mortality is to-day absolutely preventable, except in those very rare instances where as yet our prophylaxis and our therapeutics are powerless. The means of attaining the end we all have in view are outlined in the next chapter.—Ed.]

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[1] In only 6 was death due to septic causes, that is .42 per cent.

CHAPTER V.

THE TREATMENT OF PUERPERAL DISEASES.

SINCE it is an admitted fact to-day that puerperal fever is the result of infection, and that it is eminently contagious, the first indication is, by means of rigid prophylaxis, to fight against, to suppress, to prevent, in a word, the production of this infection. The second indication is, in the presence of infection, to meet it by an energetic treatment, which, of course, will vary according to the varieties of the disease. We, therefore, will consider in turn the following three subjects:

I. Prophylactic treatment.
II. Curative treatment.
III. Treatment of the special varieties.

I. PROPHYLACTIC TREATMENT.

It would appear to result from experience, that those women who have resided in maternities a certain length of time before delivery, are less likely to contract puerperal affections than those who enter in labor, or a few days before. The difference is that the first are, so to speak, acclimatized. It would thus be advantageous if all women who are going to be confined in a hospital should enter within the first fortnight preceding the expected labor. There they will be under better hygienic surroundings than is possible at home, and many of them might find there moral quietude, a condition which is lacking in many women confined in maternities.

When the expected time for labor arrives, three conditions should be fulfilled:

1. The woman in labor, and the puerpera, should be so situated that every possible cause of infection may be kept at a distance;
2. Wounds and traumatism should be avoided as far as may be;

3. Cleanliness of the most minute kind should be scrupulously attended to.

If, notwithstanding prophylaxis, infection occurs, we must without waste of time institute an energetic curative treatment, the safety of the woman being dependent on thoroughness and rapidity in its application. We must have no fear in such cases of over-action, for, as we have seen, an affection at first local may become general.

Is it possible to obtain the first of these three conditions in a maternity hospital? Although the mortality statistics from maternities in recent years are far better than those of former years, it is still true that the figures are far higher than those obtained in private practice.

In 1877, Grünewaldt, comparing the mortality rates in the large maternities and the small lying-in homes at St. Petersburg, gave the following figures:

Maternity of Grand-duchess Marie, .	1,951	labors with	2.04% deaths
School for midwives, ...	6,046	" "	2. 6% "
Foundling asylum, ...	12,266	" "	4. % "
Small lying-in homes, . . .	7,907	" "	1. 1% "

Winckel, in 1875, gave the following statistics: Lying-in homes, 361,055 labors with 5.5 deaths per 1000; maternities, 701,322 labors with 34 deaths per 1000.

Finally, Peter, in 1879, thus expresses himself: "As for the prophylaxis of puerperal fever, it is a simple matter. It means *delenda est Carthago;* away with maternity hospitals! Since crowding is the cause of the gravity of puerperal accidents, the more the overcrowding the greater the infection."

But it is not possible to suppress maternity hospitals. Happily the results obtained by surgeons by means of the antiseptic method, have cast light on the pathway of obstetricians, and the results obtained by Siredey at the Lariboisière, by Tarnier at the Maternité, and by Polaillon and Championnière at the Cochin, prove that there may be a notable diminution of the dangers which surround the women who are forced to resort to maternities to be delivered, and that the mortality rate may be greatly reduced.

While at the Lariboisière in 1854, the year of the opening of the hospital, the total mortality rate was 1 in 10.4, and the puerperal rate was 1 in 11.8, from the moment when the antiseptic system was introduced by

Siredey, the mortality rate fell successively to 1 in 35 in 1872, 1 in 145 in 1877, and 1 in 199 in 1878.

At the Cochin hospital, Polaillon has obtained a total rate of 1 in 108.7, and a puerperal rate of 1 in 160.3, for complicated labors, and 1 in 299.9, for simple labors.

Finally, Championnière, a still more exact observer of the minutiæ of the antiseptic system, has reached the wonderful figure of 6 deaths in 1455 labors, that is to say, about .41 per cent.

How now are we to gain as favorable results? Without speaking here of the proper way of building maternities, we may resume the answer in the words, *attend strictly to antisepsis, before, during, and after delivery.* Avoid, in a word, all the causes which may favor infection.

If now we carefully examine the experiments of Pasteur and of Doleris, auto-infection, strictly speaking, does not exist. It is always a question of hetero-infection. The infectious germ, the microbe, is always brought from without, and the whole question is reduced to preventing the introduction of germs, to paralyzing their action, to shutting the door into the economy, that is to say, the lymphatics and the veins. Treatment, then, should begin during the last days of pregnancy and the first hours of labor, to be continued without interruption till the seventh or eighth day, that is, until danger of infection is about over.

1. *Before Labor.*—The majority of pregnant women have an abundant leucorrhœa, and this discharge increases notably, in general, during the few days which precede labor. They often, in consequence, suffer from erythema, intertrigo, pruritus, and, as the result of scratching, from superficial erosions, frequently very painful. In such instances it is advantageous to order not only baths and lotions, but even injections of carbolic solution, morning and evening. Doleris advises solutions of 1 to 60 or even 40, but we prefer 1 to 100. Strong injections are often painful, and they defeat the end we have in view, by determining irritation around the genitals and of the meatus. When used in the strength of 1 to 100, the solution has no such disadvantage, but on the contrary is very comforting. The only precaution to be taken is, that the point of the syringe should not be inserted too deeply, and the water should flow slowly, and really bathe the vagina and the vulva without penetrating in jets. Such injections may be taken during the eighth to tenth day preceding delivery.

2. *During Labor.*—It is here that the active work of the accoucheur begins, and this is, therefore, the place to insist on the precautionary measures which should be taken.

At the outset, everything should be absolutely clean. Everybody who is going to have anything whatsoever to do with the woman in labor, physician, midwife, student—in a word, whoever is going to conduct the delivery—should have his hands scrupulously clean, his nails short, and each time before examining the woman, in particular before the vaginal touch, he should bathe his hands in a carbolic solution (1-100), and not rest satisfied with simply washing them with soap, but use the nail-brush thoroughly. The physician should never go direct to the woman in labor from a hospital ward, or after visiting patients with eruptive or septic fevers. In short, *the accoucheur should only be accoucheur*, a pure specialist in obstetrics. All the more should he avoid confinement cases where his duties or studies bring him into contact with cadavers or anatomical specimens. [This advice, while true in the abstract, is, we believe, both unnecessary and impracticable. We grant that a pathologist had best never attend confinement cases, and we also grant that those physicians in whose practice, for the time being, there are many contagious diseases or a single case of puerperal fever, will choose the wise part if they do not attend labor cases; but to attempt to make the accoucheur a specialist is leaning towards antisepticism much too far. The general practitioner, with us at least, obtains a large proportion of the confinement cases, and he may with perfect impunity accept them, and attend the patients with absolutely no risk to them, provided he takes the proper and self-suggestive precautions in regard to not carrying infection, provided he keeps himself clean, insists on the cleanliness of the nurse and the patient and her surroundings, and provided he conducts the labor in accordance with those principles, on which ample stress has been laid, which ensure the patient against putrid infection—that is to say, provided he leaves her with thoroughly emptied and contracted uterus, and with immediate suture of the perineum in case of its laceration.—Ed.]

Vaginal examinations should only be made in case of absolute necessity, and the examining finger should be dipped in oil, cerate, or, better, carbolized vaseline. We should, in particular, avoid pressure, irritation, or attempt at dilatation of the cervix. The diagnosis once established, presentation, position, amount of dilatation, the patient need only be examined every two hours until dilatation is complete, or the membranes have ruptured. Once the position assured by the touch, this becomes useless except to certify to the occurrence of rotation. In certain instances, as we have seen, it may be necessary to sustain, to push up the anterior lip of the cervix, and this little act should be performed with the greatest possible gentleness.

Lucas Championnière and Bailly advise keeping on the genitals, during labor, a compress dipped in a phenic acid solution. Tarnier places over the head, as soon as it appears at the vulva, a cloth dipped in carbolic oil, and then the head as it moves up and down in the vagina, keeps the parts moistened with the oil. We prefer, for our part, once the head has reached the pelvic floor, to pour a teaspoonful of oil into the vagina.

In case delivery calls for the application of instruments, these should first be dipped into a 1-20 phenic acid solution, and then rubbed with carbolized oil or vaseline. Interference with instruments, be it well understood, is only justifiable when absolutely called for. If labor is prolonged, if the membranes have ruptured prematurely, if the infant is dead, or the liquor amnii tinged with meconium, it is good practice to administer one or two injections of weak carbolized water, with the same precautions as those taken before labor.

The napkins, cloths, etc., should be frequently changed, and if the bowels move the fæcal matter should at once be removed, and the genitals washed carefully with carbolized water. Sponges, if they are used, should first be soaked for several days in carbolic, 1-20, and should be employed but once. Tarnier rejects sponges and uses cotton dipped in carbolic. It goes without saying, that in maternities entrance to the lying-in wards should be absolutely forbidden any student serving in the surgical wards, or in the autopsy room. The nurses should be required to take the same precautions as the accoucheur.

The woman once delivered, the toilette should be attended to with scrupulous care. The genitals should be washed with new carbolized sponges or with carbolized cotton. The 1 to 100 carbolized solution should be employed for cleansing her, it should be lukewarm, and it is prudent to administer a vaginal douche in case the woman has lost much blood, or the labor has been prolonged, or repeated examinations have been made, or the hand or instruments have been inserted into the vagina, or the infant is dead, or there are lesions of the fourchette or perineum, especially in primiparæ, where fissures and abrasions of the mucous membrane commonly occur. This precaution is all the more urgent in case it has been necessary to artificially extract the placenta, or in case the hand has been inserted into the uterus, for any purpose whatsoever, [in such instances a vaginal douche is not sufficient, but an intra-uterine should be administered by the physician.—Ed.] Next, a carbolized compress is applied over the vulva and the patient is placed in a clean bed. In case the night dress is the least soiled, it should be changed before the patient is placed in her bed.

These precautions we believe are sufficient, and we do not think it necessary to deliver, as is recommended by Fehling and Schucking, under the carbolic spray.

[It will be noted that in the views above expressed, in regard to the precautionary measures necessary for the well-being of the patient, reference is purely made to phenic acid and none whatever to corrosive sublimate. This is because, at the time of writing, the latter antiseptic had not replaced the former. To-day, however, sublimate has replaced carbolic to a large extent, even as possibly something else may replace sublimate in the not distant future, for such is the history of antisepticism. What is found inimical to germs to-day, is found far inferior to something else to-morrow. There can be no question, however, but that corrosive sublimate is superior in mild dilution to carbolic in fairly strong as an anti-microbic agent, and further it is devoid of odor. It should be remembered, however, that corrosive sublimate is much more toxic in its effects than phenic acid, and therefore, where frequent irrigation is necessary, the latter had better be used in 3 per cent. solution. As for sublimate it has been amply proved that the strength of 1 to 4000 is strong enough for routine purposes.

The precautionary measures advocated by Charpentier, are eminently judicious as applicable to maternity hospitals. In somewhat the same direction are the views expressed by Garrigues, of New York, by means of whose teaching and writing it has been unquestionably demonstrated how puerperal infection may be kept out of maternity hospitals. Although not as extreme an antisepticist as he pronounces himself to be, we are prepared to accept much of his teaching, and can testify that the excellent results obtained in the New York Maternity Hospital are largely due to the system of prevention which he introduced there, and which his colleagues in its essentials practise with him. In a recently published pamphlet on antiseptic midwifery, Garrigues thus summarizes the preventive measures against puerperal infection: "If possible the patient should take a full warm bath at the beginning of labor. Give an enema of a quart of soap-suds. Have half an ounce of bichloride of mercury divided into sixteen powders. Pour one powder into a quart bottle, add a little hot water, shake, add alternately hot and cold water till the bottle is full; shake well. This is the standard solution of 1:1000. Scrub your hands, and for operative interference, your arms with soap and water, using a stiff nail-brush, and then scrub again with the above solution. Cleanse your nails with a pocket-knife. Place beside the patient's bed a basin with solution (1:2000), in which you hold your hand, and everything that comes in contact with her genitals, for at least one minute immediately before touching her. Wash the patient's abdomen, buttocks, thighs, and genitals with solution (1:2000), and if she is not clean, scrub the parts first with soap and water. Inject a quart of the same solution into the vagina. Use no lubricant, except when the whole hand has to be introduced. Then use carbolized glycerine, three per cent. Examine rarely, and do not introduce your finger inside the os in common cases. When the presenting part begins to open the vulva, cover it with a compress wrung out in solution (1:2000). Likewise, after the child is born, express the placenta by Credé's method. If after delivery it has been necessary to introduce your fingers into the vagina, or if during delivery manipulations have been performed in this duct, inject from a pint to a quart of lukewarm solution (1:2000). If fingers, hands, or instruments, have been introduced into the cavity of the womb, or if the child is macerated, give an intra-uterine injection of two to three pints of hot solution (1:2000). Wash the patient with solution (1:2000). Put on a belly binder and antiseptic occlusion bandage. Change the dressing every six hours in hospital practice, or three times daily in private practice. Let the patient at the time of dressing use the bed-pan, and after that run a stream of lukewarm solution over her genitals and neighboring parts. No vaginal injections in normal cases. Disinfect instruments with a solution of carbolic acid, 5 per cent. If any lubricant is called for, smear them with carbolized glycerine (3 per cent.)"

Such are the rules in regard to antisepsis which have unquestionably had great influence in rendering the New York Maternity Hospital what it to-day approximates, an almost absolute safety refuge for the poor women confined there. Of course other factors have aided, such as a separate house-staff and nurses, and absolute prohibition of entrance into the wards of all who might in one way or another be the carriers of contagion. We reproduce these rules in order that any of our readers in charge of maternity services desirous of testing a rigid antiseptic system may have one at their disposal, which has certainly borne marvellous fruit. In private practice we do not deem any special set of rules necessary, provided we aim at scrupulous cleanliness and conduct the labor in accordance with the principles elsewhere emphasized in this book.—Ed.]

3. *After Delivery.*—Now begins the true puerperal period, and here it is that the antiseptic method should be used with scrupulous care.

At the outset we are met by the question of vaginal and intra-uterine injections after labor.

It would seem as though the proposal to give vaginal injections to every patient, to make the toilette internally as well as externally, should be accepted without discussion by every accoucheur. This is far from being the case, however, and curiously enough many obstetricians who reject them in normal cases (Tarnier and Bailly among others), resort to them in complicated cases, and lay stress on their utility. For our part, we attach the highest possible importance to these vaginal and intra-uterine injections. All our patients, indifferently, whether labor has been normal or complicated, receive injections by the vagina even the day after delivery. We do not use intra-uterine injections as frequently, not that we are afraid of them, but because they require more disturbance and manipulation of the patient, at a time when she should be kept as quiet as possible. But, if the lochia are fœtid, even slightly, and if vaginal injections do not suffice to overcome the fœtor at the first or second injection, we resort at once to intra-uterine injections. We reserve, then, these injections strictly for those cases where the woman is in danger of putrid infection.

Let us examine successively this question of vaginal and intra-uterine injections.

In 1873, Rendu studied this question in detail, and he shows that it was really Recolin who first, in 1757, advocated the therapeutic measure of administering intra-uterine injections. But Recolin and those who followed him, Levret, Baudelocque, Mojon, Legras, Deubel, Lachapelle, Dubois, Barbe, Liégard, only resorted to them in case of miscarriage, or to expedite the exit of the placenta, or *débris* of placenta and of membranes. On the other hand, Pasta, Doudement, de Lignerolles, Dupierris, Wray, Labalbary, Roper, Barnes, Pajot, Norris, Draper, and others, practised such injections in case of hemorrhage, and the solutions used were cold water, or dilute iodine, or dilute perchloride of iron. Not one of these, gentlemen, however, resorted to them as a prophylactic measure against or in the treatment of puerperal infection, and still today, in France, a certain number of accoucheurs, and eminent ones, are afraid of intra-uterine injections, and look upon them as more harmful than useful. Although we find in the writings of Chomel, and of Jacquemier, certain vague indications for resort to these injections as a possible means of utility in case of putrid infection, or where there exists puerperal metritis or retention of clots, these indications are laid down in a cautious spirit, and it is Gensoul who first formally advocated them, and Lizé, in 1860, first actually demonstrated their advantages. Since used and advocated by Piorry, 1866, Stoltz, 1869, Hervieux, 1870, Guyot, 1868, and others, intra-uterine injections have slowly gained their way into French obstetrical practice, until the happy results from their use have been incontestably proved. Abroad, intra-uterine injections met with no such opposition as in France. From 1840 to 1850, Grünewaldt was using them at the St. Petersburg Maternity, in the shape of chlorine water, one teaspoonful to three quarts of water. He resorted to the injections within the first hours after delivery, in case the temperature rose, and he proved that since the adoption of this practice, the number of serious puerperal cases had notably diminished, and that such injections were not only advantageous, but so inoffensive that he did not fear to use them in case of every and any puerpera within a few hours after her confinement.

In 1878, Winckel, after having employed them in cases of puerperal endometritis, hemorrhage, retention of placental *débris*, etc., and after having successively used a solution of sulphate of copper (2 or 5 to 200), of tannic acid (2 or 5 to 200), of carbonate of soda (5 to 100), of subsulphate of iron (50 to 100), of permanganate of potass (10 to 200), he settled upon the following practice:

In case of any labor which has been terminated artificially, administer a vaginal and a uterine injection of a solution of phenic acid (5 to 100) immediately after the delivery of the placenta, and repeat every three hours in the strength of 1:50. In case the lochia become fœtid, in case there exists a sloughing surface of the genitals, in case of retention of the lochia, in addition to intra-uterine injections, uterine drainage as advocated by Fritsch and Schede should be resorted to.

Eisenmenger, in 1853, made successfully intra-uterine injections of water containing pulverized carbon; Bischoff, 1877, used vaginal injections of phenic acid (1:50) from the onset of labor; after delivery he resorted to vaginal and uterine injections with a solution of 1:10, and inserted into the vagina a cotton tampon saturated in the same solution. In case of hemorrhage, the solution for intra-uterine use was of the strength of 2 or 3 to 100, used twice or three times daily during the first twelve days, and, in addition, every two hours a vaginal douche was administered.

Haase, Beinlich, use the solutions of phenic acid of 1 and 2 per cent.; Egermann, 3 to 5 per cent.; as also Weber, Riegel, Radecke, Spiegelberg, Fasbender; Spiegelberg, however, only recommending them in case of puerperal complication. The vaginal secretions coming from wounds of this tract are in his opinion inoffensive, and he hence rejects intra-uterine injections unless they are strictly indicated and then he strongly advocates them. This is the practice endorsed by Schroeder, Weisl, Duncan, Hausmann, ourselves, and many others. Fehling has successively used creosote, permanganate of potass, phenic acid, and finally recommends salycilic acid (1:300); during labor washing of the hands with the same solution; after delivery insufflations of powdered salycilic acid, and the use of salycilized cotton. The insufflations should be practised once or twice daily in primiparæ. In case of fever, intra-uterine injections at once should be administered, and especially vaginal six or eight times daily, with salycilized solutions (1:600 to 1:1000.) Filatoff, Hörder, Kolbe, Meissner, Credé, Leopold, Ahlfeld, Fürst, Henning, also use solutions of salycilic acid for intra-uterine injections.

Fritsch advocates lavage of the vagina after every delivery. He reserves intra-uterine injections for those cases where there has been instrumental or manual interference, dead, macerated or putrefied child, fœtid lochia, fever. They must also be used in case of grave and advanced septicæmia.

Munster, Richter, are partisans of intra-uterine injections, and after having tested phenic acid solutions, express preference for salycilic. They state that phenic acid produces burning sensations, and eczema of the genital organs, and that in certain instances toxic symptoms have been produced.

Chamberlain, Schultz, Schulein recommend intra-uterine injections.

The latter advocates, before and during delivery, disinfection of the hands and arms of the accoucheur and of the nurses with a carbolic solution of ½ per cent. The examining finger should be washed in a 10 per cent. solution. After delivery he washes out the vagina and uterine cavity with a quart of carbolized water (3 per cent.) At first he limited his practice to vaginal injections in every labor, but latterly he has used intra-uterine as well. In grave cases, or where the hand has been introduced into the uterus, or where there is fœtor or hemorrhage, he washes out the uterus with a 5 per cent. solution of phenic acid. During the puerperium he resorts simply to vaginal injections in case of normal conditions, reserving intra-uterine injections for cases where there is suspicion of infection—that is to say, whenever the uterus is tender, or there is peri- or parametritis, or fœtid lochia, and finally whenever the temperature rises above 101° or, remaining normal, the pulse rate increases in frequency. He uses a glass tube, and the ordinary strength of the solution is 40 or 50 per cent. In 26 cases where there existed puerperal infection, he used but one injection and had 26 recoveries; and in 29 women seriously infected, where the injections were administered a number of times daily, all recovered. Schulein concludes that carefully administered intra-uterine injections are harmless, that they diminish notably the number of cases of puerperal infection, that they take off the edge, so to speak, of infection when it occurs, and that after them the temperature is lowered in a few hours.

Schede, Langenbeck, go to greater extremes still, and counsel drainage of the uterus, and Schucking has proposed continuous irrigation of the organ.

Langenbeck proceeds as follows: He inserts two rubber, disinfected, tubes, 4½ inches long, with lateral openings, so that they project about ½ an inch from the vagina. At first the uterus contracts and endeavors to expel the tubes, but soon the contractions cease. He then injects for three minutes a 3 per cent. solution of phenic acid through one of the tubes. He leaves the tubes *in situ* during twelve hours, then removes, disinfects, and re-inserts them. The same manœuvres are performed for two days, and on the third he withdraws one tube, and the other on the fourth day.

Drainage of the uterus does not irritate it, but, on the contrary, quiets and abates the inflammatory process. It facilitates greatly the evacuation of putrid matter, and thus gets rid of the main obstacle in the way of cure. This drainage further assists greatly intra-uterine irrigation.

Schucking proceeds as follows: A large metallic catheter is cut at its end and bound to a metallic drain tube, pierced by numerous openings and covered with Lister gauze. The gauze lies in the vagina as a thick wad; the drain is at the internal os, and subserves the purpose of allowing the escape of the secretions. The gauze aims at keeping the disinfectant solutions in contact with the uterine and the vaginal walls. Immediately after labor the apparatus thus prepared is introduced to the fundus.

The uterus is first washed out with a 5 per cent. solution, and then the irrigating fluid is allowed to flow in for a number of hours. This fluid is composed of 10 per cent. sulphate of soda and 5 per cent. of glycerin. The catheter is withdrawn every twelve hours, disinfected in 5 per cent. carbolic, and wrapped with fresh disinfected gauze. This treatment is to be continued for six to eight days.

To the above more or less pronounced advocates of intra-uterine injections we must add the names of Playfair, Braxton-Hicks, Schroeder, Gusserow, Müller, Dominico, Chiara, Stoltz, Courty, Laroyenne, Bouchacourt, Delore, Pajot. The great majority of obstetricians, and we think rightly, reserve such injections for those cases where there is fœtor of the lochia,. retention of septic products, in a word, putrid infection. Among those who reject such injections, or at least only resort to them exceptionally, we mention, in France, Jacquemier, Depaul, Blot.

All French obstetricians, however, do not accept even vaginal injections, and although Pinard and Budin, pupils of Tarnier, practise both uterine and vaginal injections, Tarnier himself, and Bailly and Guéniot, reject both entirely. Abroad, as we have stated, Fehling and Spiegelberg use intra-uterine injections only exceptionally, and vaginal injections, as a routine measure, are rejected by Runge and Hoffmeier. Frommel, finally, reports a number of cases where accidents have resulted from the use of vaginal injections, such as those recorded by Küstner, Fritsch, Richter, Veit, Olshausen, Fischer, Staude, Tarnier, Bailly, Guéniot.

The opponents of injections, whether vaginal or uterine, make the following objections to them:

1. *They expose the Patient to the risk of entrance of Fluid into the Tubes*

and thence into the Peritoneal Cavity. Although Haselberg, Barnes, and others, have cited cases where the solutions of iron have passed by the tubes into the peritoneal cavity, these were instances of hemorrhage where the uterus was relaxed, inert, capable of distension without power of contraction, and such is not the state of the uterus in the instances where intra-uterine injections are recommended, and the experiments of Guyon, Guichard, Danyau, Guérin, Delore, Fontaine, and others, prove that injections, in order to pass into the tubes, must be given with a current force never used in practice. The first objection is, therefore, not valid.

2. *They cause Hemorrhage.*—Although Münster, Schucking, and Richter have noted hemorrhage in certain instances, such cases are very exceptional, and the hemorrhage in any event does not amount to much.

3. *They expose the Patient to the risk of entrance of Air into the Uterine Sinuses.*—As Rendu with justice says, the instances recorded by Depaul, Olshausen, Litzmann, Spiegelberg, Scanzoni, Williams, Winckel, and others, concern vaginal injections used for the purpose of inducing labor. Matthews Duncan has reported a case where the solution entered the uterine sinuses. But, it is pertinent to ask, what do these few cases prove when compared with the innumerable ones where intra-uterine injections have been not only not harmful, but positively useful?

4. *They provoke Chill, Metritis, Peritonitis.*—As for metritis and peritonitis, we believe there is an error of observation, for it was not the injection which in these cases caused these accidents, but, on the contrary, it was because they existed that the injections were administered. As for the chill, it is true enough frequently seen after intra-uterine injections. But this chill is not, we think, pathological, for as a rule it is followed by amelioration, and it is constantly followed by notable diminution in temperature and pulse. Certainly, in exceptional instances, intra-uterine injections may determine accidents, even as vaginal injections have aside from pregnancy or the puerperium; still, even as the majority of obstetricians are not thus deterred from ordering vaginal injections, even so we should not lose sight of the incalculable benefits to be derived from intra-uterine injections, because in a few instances they have seemed to be harmful.

We are then a partisan in favor of vaginal and intra-uterine injections, but, in agreement with the majority of accoucheurs, while we cause vaginal injections to be administered to all our patients whether the puerperium is normal or pathological, we reserve intra-uterine injections for those cases where they are strictly indicated, and necessarily so. We reproduce the rules which guide us in practice, rules which we have followed for six years and which have served us well, for during this period we have lost but two patients out of about 600 in private practice. If the labor is normal, if neither manual nor instrumental interference has been necessary, we limit ourselves immediately after labor to scrupulous cleansing of the external genitals with carbolic solution (1-20), a washing which is renewed every six hours. Vaginal injections of the same solution, warmed, are administered from the day after delivery twice daily, and are thus given for a fortnight. At the end of this period, and until the return of the menses, warm water alone, or with the addition of cologne or lavender water, etc., is substituted for the phenic acid solution.

If we have been obliged to interfere during the labor, if the liquor amnii was tinged with meconium, if the infant was born macerated or putrified, if there is hemorrhage, etc., we administer a vaginal douche, and if need be an intra-uterine, immediately on the completion of the third stage, and the vaginal injections are repeated daily. In case the lochia become fœtid, we repeat the vaginal injections daily, and we limit ourselves to such injections as long as the patient's condition is satisfactory. In case, however, there is retention of the placenta or of the membranes, especially after miscarriage, and above all if fever, chill, or other phenomenon pointing to putrid infection occur, we have recourse not only to vaginal, but to intra-uterine douches.

Until Rendu's thesis was published, in 1879, without entirely rejecting intra-uterine injections, we were afraid to practise them. Since then, however, we have used them frequently, both in our private practice and in consultation cases, and they have always given us excellent results. Let it be understood, however, that intra-uterine douches are to be administered with care, and *always by the physician* himself.

We proceed as follows: we use Stoltz's double current catheter and a syringe, with pointed canula, the capacity of which is about ten ounces. To each end of the catheter are adapted rubber tubes about nine and three-quarter inches long. One of these tubes receives the point of the syringe, the other is for the exit of the fluid. We use a one per cent. phenic acid solution for the irrigating fluid.

The patient is placed across the bed, the buttocks at the very edge, lying on a rubber cloth. The index finger of the left hand is inserted to the cervix, and the catheter is guided along it into the cervix and to the fundus. The phenic acid solution is warmed to 85°, the syringe is filled with it, the canula is inserted into one of the rubber tubes, and the uterus washed out. A similar injection is given two or three times until the fluid returns clear, about a pint of the liquid being ordinarily used. The catheter is then withdrawn. By pushing the piston slowly the fluid is injected not in jets but continuously, and all shock is avoided. The intra-uterine injection is followed by a vaginal, and the process is repeated if necessary in twelve hours.

In brief, then, the treatment, *par excellence*, we believe to be lavage of the uterus, by carbolized solutions, thus keeping the utero-vaginal canal in a state of perfect cleanliness, and thus preventing the retention of any body which through decomposition might cause septic infection.

In case there exists wound of the vagina, tear of the perineum or of the fourchette, we apply over the genitals a compress saturated in the phenic acid solution. At the same time we ventilate the lying-in room properly, and we stimulate our patients by giving them from one-half to one ounce of alcohol daily in the form of punch.

Lucas Championnière, an antiseptic surgeon, does not approve particularly of vaginal injections during the puerperium. We reproduce the rules he insists upon at the Cochin hospital, by means of which he has been able to reduce the mortality considerably.

"It is absolutely forbidden to touch a patient without first washing the hands in a 2½ per cent. solution of carbolic. Carbolized oil 1 to 10 or 1 to 5 is used for anointing the fingers; after delivery the vulva is washed with a 2½ per cent. carbolic solution, and often with the stronger solution, 1 to 20. A compress dipped in the weaker solution is kept over the vulva, and if the vagina or the perineum has been torn, it is washed with the stronger carbolized solution. Immediately after delivery the genitals are carefully washed with the same solution. After operations which have necessitated the introduction of the hands or of instruments into the uterus or vagina, I wash out the utero-vaginal canal at once with the 2½ per cent. carbolic solution, taking the precaution to secure free exit of the fluid.

"The daily injections recommended by certain accoucheurs I absolutely prohibit in my service, aside from exceptional cases, since I believe them to be the cause of irritation. When it is necessary to tampon I use only carbolized cotton.

"Finally, suppress the use of plain water in maternities; disinfect all the linen by means of heat and carbolized water; never torment the genitals of the woman, even to obtain antisepsis; give the woman rest and a proper amount of food; insist on all the surroundings of the woman being antiseptic." It is apparent, then, that Championnière's rules are approximately our own, except in regard to injections (vaginal) which he dispenses with, and which we favor.

[Charpentier's general deductions in regard to vaginal and intra-uterine douches during the puerperal state, are in accord with the practice of the majority of practical accoucheurs in the United States. In certain details, however, many will differ from him.

In studying this subject, it is above all necessary to bear in mind the vast difference which exists between maternity hospitals and private practice. In the one there are present conditions which are never met with in the other, and therefore, rules applicable to and essential in the one are not at all necessary in the other. In maternities we are face to face with the so-called hospital air, with the evil influences which necessarily follow on the crowding of a number of patients in one ward, with the risks which may result from neglect on the part of a practically irresponsible house or nurse-staff; these and the like conditions call for stringent antiseptic rules, in order to insure what, after all, is at the bottom of the whole matter—cleanliness. In private practice, however, and not purely among the higher classes, but as well among that great middle class, where the women are still able to be confined at home, the conditions are very different. We are dealing with but one puerpera, in one room, and with one attendant. The chances for infection are hence so much the less, the possibility of cleanliness without antiseptics is so much the greater, and therefore it is why we would very sharply demarcate the rules necessary, essential, in the one case, and scarcely at all so in the other. In the hospital, antiseptics are necessary, it would be criminal not to use them; in private practice, they are unnecessary where the prophylactic measures which we have dwelt upon at sufficient length are strictly attended to. We are speaking now, of course, of the average year, and not at all of one when puerperal fever is epidemic, when obviously the rules for private practice should be no less stringent than those for hospital. If these views are granted as sound for city practice, how much the more so for country.

While, therefore, we are as firm an advocate as any one for antisepsis of the strictest possible sort in hospital practice, we believe it not essential to success in ordinary private practice, provided we do obtain strict cleanliness, and this can be secured without the use of antiseptic solutions.

The question as to the necessity of administering the vaginal douche as a routine measure after normal labor, and during the normal puerperium, is one on which there is much difference of opinion. It has been proved practically unnecessary at the New York Maternity hospital, whether so on account of the so-called occlusion binder, devised by Garrigues, and which the patients wear, or not, we cannot say; but the moral is that if they may be dispensed with in a hospital, they certainly can be in private practice, and it is not our custom to order them during the first week, unless in the presence of indications. Not that we are afraid to use them, for a carefully administered vaginal douche by means of a fountain syringe (Fig. 190), and through a tube without terminal opening, ought never to injure the patient in the least. The douche is certainly soothing to the patient, it is cleansing, and if used, as it should be, hot, 112° F., about, and in sufficient amount (one quart at least), it unquestionably has a beneficial effect on involution. Our main reason for dispensing with it as a routine measure, is that it is impossible to give the douches ourselves, and we cannot always trust to the skill or absolute cleanliness of the nurse. Patients apparently do as well where the vaginal douches are not given, and therefore, except in the presence of some indication, we do not see any special utility in ordering them. Certain accoucheurs, however, are in the habit of using the douche twice daily as a routine measure, and the question is one which every accoucheur is at liberty to decide for himself.

As for the intra-uterine douche, there exists absolutely the same indications in maternity hospitals and in private practice. The difficulty is not so much to decide when to administer it, as how often to repeat it. As Mundé has rightly insisted, there comes a time when repetition of the douche apparently does harm.

The foremost indications for the intra-uterine douche are fœtor of the lochia, in the presence ordinarily, therefore, of putrid infection, and, as we have already stated, whenever the hand or instrument has been introduced into the cavity of the uterus. None of the accidents which are said to be possible as the result of administering such a douche, are at all likely to occur if a proper tube be used, if it be inserted carefully and full of the solution, and if we remember that our aim is to wash out the uterus and not to inject it—that is to say, it is better to use the continuous stream from a fountain syringe, and not the intermittent from a Davidson.

The injection tube which we prefer is the Chamberlain, although a double current catheter, or in an emergency a gum-elastic catheter will answer very well. It is not after all the kind of tube, but the manner of inserting and the manner of injecting, which are of the greatest importance. The solution used, whether carbolic, or sublimate, does not we think make any special difference in the result. Our object is to wash out from the uterus the products of decomposition, and to disinfect the cavity. A point to be remembered is that certain patients are very susceptible to mercury, and that, therefore, a solution of the strength of 1 to 4000 is strong enough. The solution should be hot, at least 110° F., in order to avoid possible chill, and in order to obtain the styptic, con-

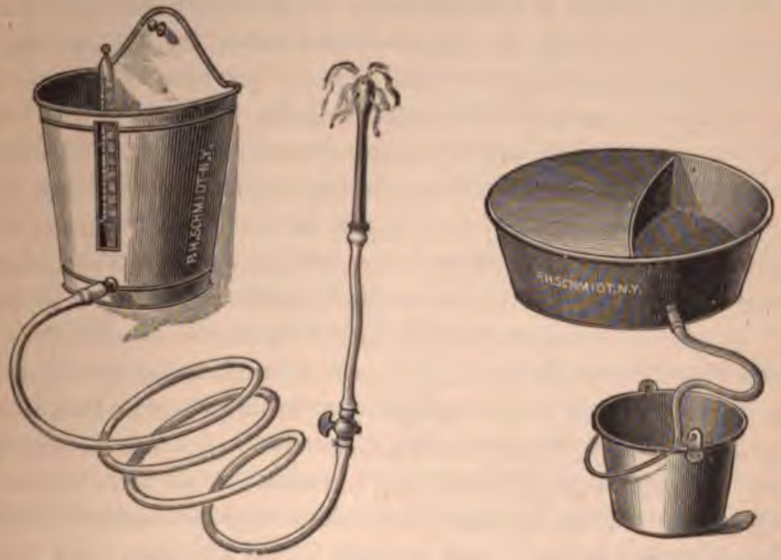
P.H.SCHMIDT.N.Y.
P.H.SCHMIDT.N.Y.

Fig. 190. Fig. 191.

Figs. 190 and 191.—Mundé's Douche Can and Bed-Pan tractile, effect of heat. At least one quart of water should be used at each injection. On several occasions we have used a mixture of iodine and water in equal parts, in case of endometritis with good results. A vaginal injection should be given before the intra-uterine, and it goes without saying that, in any case where the uterus is supposed to contain portions of placenta or secundine, which from their decomposition are causing the septic symptoms, careful exploration of the uterine cavity with the finger or curette under, if need be, an anæsthetic, should precede the intra-uterine douche.

As to the frequency of administration, it is difficult to speak with positiveness. In our hands the douche is used mainly for the purpose of cleansing the uterus, and not so much for its undoubted effect on the temperature. It has seemed to us, therefore, not advisable to repeat the douche more than twice, as long as fœtor is absent. For the reduction of the temperature we depend rather on means to be mentioned shortly. In case of septic endometritis of high degree, the use of iodoform pencils in the uterus, to be inserted between the douches, has been strongly recommended, but this seems to us inadvisable, because of the fact that we thus run the risk of disguising the danger signal, the call for another douche, that is to say, the fœtor. We believe that in mild cases of endometritis one thorough douche will often be the only one requisite. In severer instances the douche may be given every two hours even, without fear of injuring the patient, but, on the contrary, to her positive benefit.

There is one point in regard to the intra-uterine douche on which sufficient stress cannot be laid, and this is that it is useless and is not indicated except where the source of infection lies in the cavity of the uterus. Exudations around the uterus, whether of septic or traumatic origin, are not benefitted, but may be, on the contrary, intensified by manipulation of the uterus. The point to be decided is whether the endometrium is at fault, whether the cavity of the uterus contains a putrescent body, and this can only be settled by careful bi-manual palpation under, if necessary, anæsthesia. Fœtor, rise of temperature, chill, may depend on a lesion of the vagina or cervix, as well as on infection from the uterus. We must first differentiate the source of the infection, as nearly as may be, and where in doubt, in the absence of evidence of cellulitis or of peritonitis, it is a good and a safe plan to give with care one thorough intra-uterine douche.

Reference to individual practice and methods is out of the question here, nor is it at all necessary. There is hardly an accoucheur of any note, who has not of late years expressed his views in regard to vaginal and uterine injections. The majority certainly grant the broad general principles on which the uterine douche in particular is based, even though they differ in minor details. Accurate diagnosis is above all necessary, and then, in the presence of strict indication, the uterus may and should be washed out, and thus frequently is a most forlorn hope saved.

In administering the intra-uterine douche, there are certain details attention to which will facilitate the procedure, and render it less irksome and disturbing to the patient. It is above all necessary to determine at the outset the exact position of the uterus in order to insert the tube with as little traumatism as possible. This position may be ascertained by means of the bi-manual palpation. The choice of the tube is, we believe, a matter of some importance. An inflexible tube is preferable to a rubber, for the reason that it cannot be compressed, and therefore a continuous flow is assured. We have already insisted on the necessity of closure of the central orifice of the tube, for the reason, to quote Mundé, "that, although not often likely to occur, it is still not impossible that the jet of injection fluid, thrown from the central terminal opening of a uterine tube, may dislodge a fresh thrombus at the placental site, and air enter the venous circulation, or a secondary hemorrhage be produced. . . . . In order that this may not occur with side openings, it is well to have the latter so arranged as to throw the jets slightly backward." It is not at all essential to use a double current tube, for the reason that in all cases where the uterine douche is called for, the uterine orifices and cervical canal are wide open, and there is no obstruction to the return flow by the widest outlet.

The patient should lie on a self-discharging bed-pan, since thus we are at liberty to use as much fluid as we desire continuously without disturbing the patient for the purpose of emptying the bed-pan, as is necessary when the ordinary china bed-pan is used. The external genitals are first to be carefully washed, and the tube, filled with the hot fluid, is then inserted into the vagina and this canal thoroughly douched. Then, guided preferably by the index of one hand, the tube, still full of fluid, is gently inserted into the cervical canal to the internal os, and then the handle is depressed or elevated or rotated, according to the position of the uterus. When sufficient fluid has been allowed to flow into the uterus to acquire a clear return flow, the tube is withdrawn carefully and the manipulation is at an end. In case of a slight chill, this is of no import, and will soon subside of itself.

We would conclude this matter with two recent expressions from eminent authorities which, we think, summarize this question of intra-uterine douching in a nut-shell.

Mundé says: "I desire to put myself on record in this matter of intra-uterine injections, which have been recommended by eminent authors in every instance of rise of temperature in the puerperal state. I do not agree with this practice unconditionally, for if there be no fœtid lochia, no evidence of intra-uterine decomposition, I believe there is nothing to be gained by intra-uterine irrigation, even though there be a rise of temperature. On the other hand, the presence of offensive lochia without a rise of temperature does not necessarily call for intra-uterine irrigation, since many women have offensive lochia without the slightest constitutional disturbance. In such cases I think vaginal irrigation all-sufficient. I wish to qualify these statements by saying that even in the absence of offensive lochia, if there be no obvious cause for the elevation of temperature, it may be a wise precaution to irrigate the uterus once or twice; but after such irrigation, there being no detritus removed from the uterus, I should consider further irrigation useless, and perhaps even injurious, and whether the temperature fell or not, I should then look elsewhere for the cause of the rise, and seek to reduce it by other means. Finally, I believe that intra-uterine irrigation should be discontinued as soon as it fails to remove decomposing matter from the uterine cavity, even though the temperature may not be reduced, for I think that I have seen the continuance of uterine irrigation under such circumstances cause hemorrhage, chills, abdominal tenderness, and be even followed by increase of temperature, which symptoms I am inclined to attribute to the traumatic irritation caused by the passage of the tube and the injection."

Lusk says: "In the treatment of puerperal fever, the intra-uterine douche is warmly recommended, but it cannot be too strongly insisted upon that, in a rightly conducted confinement, infection does not begin in the uterine cavity, and that the need of such injections is a confession of faulty procedure. There are two forms of fever which cannot be reached by the uterine douche, one derived from sewer poisoning, and the other from peritonitis, starting from some of the recently studied forms of tubal disease."—Ed.]

II. Curative Treatment.

Where, notwithstanding all our precautions, puerperal affections arise, we must resort at once to the curative treatment. Is this treatment the same for all cases, does there exist, in a word, a general treatment applicable to every case? Certainly not, and the treatment must vary with the variety of the disease. We believe, however, that there are two agents which should ever be employed, and which in many instances have a most marked beneficial effect. These agents are quinine and alcohol. The quinine should be used in doses of fifteen to thirty grains daily, and the alcohol is to be given in any suitable form. These two agents, combined with the carbolic douche, are for us the remedies *par excellence*. We much prefer them, and they appear to us much superior to either aconite and quinine, as recommended by Depaul, the eucalyptus globulus, the salycilate of soda used in Germany, the Warburg tincture, used in England. [Warburg's tincture will be found of special utility in those instances where the symptoms are not specially decided in favor of sepsis, but point rather to a malarial element complicating the puerperal state. It is best administered in capsules containing a drachm of the inspissated tincture, and the guide to the dose is the effect on the bowels. The combination acts to best advantage when the bowels are lightly touched, and in our experience two capsules administered each night will have the desired end. In case the woman is constipated, we have found it useful to prepare the way for the Warburg by giving a full saline laxative some hours previously to the first capsule. Obscure cases of fever in the puerperal state, without special definite symptoms, but occurring in a neighborhood where the causes of malaria are rife, will often find their explanation in the way in which they yield to Warburg's tincture.—Ed.]

To pass now to the treatment of the different forms of puerperal fever, we range these forms under the following heads.

1. The inflammatory form, metritis, peri- and parametritis, circumscribed and generalized peritonitis.
2. Putrid infection.

3. Purulent infection.
4. True septicæmia.
5. Phlegmasia alba dolens.

In the first four forms we must act energetically and quickly, since success will depend in great part on the little time which has elapsed between the appearance of the symptoms and the institution of treatment.

1. *Inflammatory Affections.*—a. *Metritis, perimetritis, parametritis.*—The first phenomena are chill, pain, and fever, and it is against them that we must bring to bear our therapeutics.

The first thing to do is to warm the patient by means of hot-water bottle, bed-clothes, warm alcoholized drinks, and next to control the pain and the first inflammatory symptoms. Local venesection by means of wet-cups or by leeches admirably subserve this purpose. We much prefer leeches applied over the site of the pain at the point of maximum intensity. Ten leeches on each inguinal region will ordinarily diminish the pain notably, and if this persists the leeching must be renewed. They are to be allowed to drop off themselves, and bleeding for a number of hours afterwards is to be encouraged by hot fomentations or by poultices. At the same time, about ten grains of the sulphate of quinine should be administered, to be repeated morning and evening on the following days. The leech-sites are to be thickly spread with belladonna ointment (*onguent napolitaine belladonné*), morning and evening, and over this hot poultices are to be kept. The bowels are not to be moved till the third day and then by means of oil and glycerin enemata. If this does not suffice, a mild purgative should be given. From what we have already stated, the patient receives a carbolized douche morning and evening, repeated more frequently if the lochia become fœtid. In case the disease is complicated by peri- or parametritis, if the pain recurs, we renew the leeching, although in this event we prefer a large fly-blister. We abstain from local examination. Later, if the affection changes into phlegmon, or pelvic peritonitis, we resort to the blister, and when the affection abates, we administer baths. In certain cases, where the tongue is markedly coated, we have begun the treatment with advantage by giving an emeto-cathartic.

Nourishment during the early period should be limited to milk, bouillon, punch, lemonade, beer.

Such is the treatment which ordinarily suffices in case of metritis and pelvic peritonitis. There is one point on which we specially insist.

When indurated masses appear around the uterus recovery is very slow. If the exudation suppurates, the fever persists for many days, the chills are frequent, the temperature rises every evening, sometimes with very acute exacerbations. Often diarrhœa and vomiting set in. The abscess once open, notable amelioration ensues, and then either it discharges freely and the patient convalesces well, or else after the lapse of a few days the discharge of pus ceases, the abscess refills, and chill and fever reappear. These phenomena may be repeated a number of times, gradually sapping the woman's strength, and often she dies of hectic. It is sometimes of advantage to enlarge the cavity, but this is not always possible. When the abscess, as is the rule, opens by the vagina or rectum, enlargement presents more risks than advantages, and it is only when the opening is in the abdominal wall that it is sometimes of advantage to enlarge it, or even to incise it deeply without awaiting spontaneous opening.

[We would disagree somewhat with Charpentier. Abscess in the pelvic cellular tissue or encysted in the peritoneum, should be opened as soon as it points, the cavity washed out and drained, or if small, it should be packed with iodoform gauze. In other words, abscess in this locality should be treated on the same surgical principles as are applicable to abscess in other parts of the body. There is every advantage to the woman, for we not only save her strength and control the hectic, but we also forestall possible rupture into the rectum, or worse still into the general peritoneal cavity. The treatment of such abscesses really belongs to works on gynecology, and we will not enter upon it here. It is well to state that recent views tend to the teaching that many such abscesses are intraperitoneal and result from tubal or ovarian disease, and this brings up the question whether for cure abdominal section and removal of the purulent sac is not the preferable and necessary method. For an answer to this question, however, we must refer to recent and current literature. It should be stated, however, that the majority of puerperal exudations tend, under proper treatment, towards spontaneous cure.—Ed.]

If, on the contrary, the exudations tend towards absorption, it is still only after weeks or months that convalescence is assured.

In one or another case our general treatment is the same. Revulsion over the exudation by iodine, fly-blisters, and sulphate of quinine and general tonic alimentation. The patient, however, must remain in bed as long as there exists induration at all painful. After an examination at the outset, to make our diagnosis, we abstain from local interference, unless there be special indication, until the patient is convalescing, and we do not allow our patients to rise until the uterus is fairly movable.

Although, in general, recovery is generally complete, the patient often complains for long of abdominal pains, the result of traction on the pelvic organs, by the adhesions which have formed between them, the intestines and the pelvic walls.

b. *Peritonitis.*—The treatment of this affection is similar to that of metritis at the outset, leeches, quinine, belladonna ointment. The quinine, however, should be given in larger dose, at least thirty grains daily. But peritonitis is accompanied by gastric and intestinal disorders, nausea, vomiting, tympanites, against which numerous agents have been recommended. Doulcet, Willis, Leake, Fincke, Osiander, and others, have advocated an emeto-cathartic, and we have ourselves in certain instances given it with success. Puzos, Helm, Denman, Chaussier, Gordon, advise purgatives.

It is not uncommon, indeed, for the patients to suffer from obstinate constipation. Calomel and jalap have been often used. We believe in being very reserved in their use, for as a rule, a profuse diarrhœa succeeds the constipation, and Hervieux has noted an alternation between the diarrhœa and the vomiting.

Baglivi, Clarke, Baudelocque, Velpeau, Championnière, recommend blisters; covering the entire abdomen is Velpeau's advice. Championnière uses them from the outset to combat the initial symptoms. We believe in vesication, but not at the beginning of the affection. On the fourth or the fifth day, and even later, when the peritonitis is subsiding, this is when we believe them useful. Hervieux, who uses them from the outset, admits that they have disadvantages, such as the production of retention of urine, of cystitis, of ulceration, of diphtheritic patches, gangrene, etc. We prefer leeches to blisters in case of pain, and it is especially as resolvents that we use the latter, that is to say, at the end of the disease. The blister has seemed to us especially useful when the peritonitis has resulted in the formation of those masses, sometimes enormous, which fill the hypogastric region and even beyond. It is in such instances that frequently repeated blisters have rendered us real service.

Mercurials have been recommended, and although we reject them internally, we approve of them externally. This is the practice of Depaul.

We have been struck by one fact, and this is that the only patients who have recovered, are those who have been salivated. Hervieux has made the same remark, and has noted that as soon as the buccal signs of mercurialism have appeared the inflammatory symptoms have decreased.

Béhier has advocated applications of ice, but we have tested them without success, and in a hospital case we witnessed gangrene of the abdominal integument as the result of too prolonged application.

Opium is of great utility, either by the mouth or subcutaneously.

As for baths administered during peritonitis, we do not think they should ever be employed until convalescence, and then with great care.

To resume then the treatment we advocate: As soon as the initial symptoms appear, twenty leeches on the abdomen, fifteen grains of sulphate of quinine, opium, and carbolized vaginal injections. After the leeches have fallen and the bleeding has ceased, mercurial ointment should be rubbed over the abdomen, one ounce in the twenty-four hours. Alcohol in the form of punch should be administered. On the third day, an enema of oil and glycerin, and, if called for by obstinate constipation, a purgative. About the fifth day repeated blisters.

Phenic acid internally has not seemed to us useful. In a single case we saw Depaul puncture the intestine without relief to the tympanites.

[The treatment of puerperal peritonitis which is preferred to-day by many authorities, differs essentially from that which is favored by Charpentier. At the outset of inflammatory symptoms in the puerperal state, it is believed to be good practice to administer a sharp saline purgative, in order to produce free derivation from the intestinal canal. This accomplished, opium in sufficient doses to absolutely quiet the pain is indicated. As long as the temperature remains below 102°, hot poultices, changed frequently, are called for. Just as soon, however, as the temperature rises above 102°, the ice coil should be substituted for the poultice, and kept over the abdomen if need be, for days. It will not cause gangrene of the abdominal walls if the precaution is taken not to apply it directly against them. The ice-coil not only checks the temperature rise, but lessens markedly the tympanites. For the special relief of this condition, enemata of turpentine administered through a long rectal tube are of great service. If the distension becomes so great as to seriously interfere with respiration, puncture, repeated if need be, of the intestine will often give relief. For the fever, aside from the usefulness of the ice-coil, our reliance to-day should be not on quinine, but on antipyrin. This drug should be pushed cautiously but boldly, to the extent even of fifteen or twenty grains every two or three hours. It had best be administered in suppository, since we should aim to keep the stomach as quiet as possible. To guard against the depressing effect of antipyrin on the heart, alcohol should be administered freely, and when giving the drug in large doses, an occasional hypodermatic injection of digitalin is useful. As for food, it should be given as freely as possible and predigested. Peptonized milk, raw eggs, brandy, alcohol, these are indicated to the extent which the stomach will stand. In case the stomach refuses everything, give it absolute rest, and support the patient on stimulants hypodermatically, and peptonized milk per rectum. By washing out the rectum with cold water before giving each nutrient enema, it will not react against them, usually, for some time. As for blisters, we consider them more harmful than useful, as long as the inflammation is at all acute.

The great indications in puerperal peritonitis are: Clean out the *primæ viæ* at the outset; keep down the temperature; feed the patient. These indications are all fulfilled by the treatment we have outlined, a treatment which requires faithful application and constant watchfulness, true enough, but in case of puerperal peritonitis, it is a bitter fight for our patient's life, and the measures we have recommended will often, if resorted to in time, save this life.—Ed.]

2. *Putrid Infection.*—In this affection, whether it results after miscarriage or labor at term, whether it is due to retention of the placenta, membranes, clots, or to the penetration of infectious germs (Pasteur and Doleris), there is one symptom which leads all others, and this is fœtor of the lochia. Therefore we place first among therapeutic measures injections, not only vaginal but intra-uterine. Two intra-uterine injections daily of 1-100 phenic acid solution, and five to six vaginal injections in the intervals—such is the treatment, in addition to quinine as much as forty-five grains to one drachm in the twenty-four hours, and alcohol in in one or another form.

If the removal of the placenta, membranes, or clots can be readily accomplished, we must begin by this, but we reject all those methods which come to us from the other side of the Rhine, and which consist in removing these remnants by means of curettes. We allow such remnants to detach themselves, and we prefer to wash them out by means of injections, or wait for their appearance at the cervix before attempting their removal. It is only in cases of absolute necessity that we interfere. Here the local condition does not amount to much, but it is the general condition which calls for action, and we limit our efforts to inunctions of belladonna and to laudanum poultices over the abdomen.

Sustain the patient by soups, beef extracts, alcohol; fight the sepsis by sulphate of quinine and phenic acid douches—such are the methods which are for us rational. We thus gain time, and we thus give Nature a chance to shake off the putrid matter, and the patient a chance to eliminate the poison.

[From the criticisms made in Vol. II., under the subject of Miscarriage, it is apparent that we cannot accept this doctrine. Indeed, as soon as we suspect the presence of any foreign body in the uterus, we would at once proceed to remove it by the finger if possible, by Mundé's curette and forceps if the finger failed. We contend and we know that such manipulation is harmless if performed with care, and we utterly fail to see what is to be gained by waiting on Nature. The source of the sepsis is in the uterus, and as long as it remains there the patient is more deeply impregnated. The experience of some of our most distinguished authorities, here and in Germany, proves that manual or instrumental removal of placental *débris*, secundines or clots, is safer for the woman than leaving them in the uterus. We insist anew, therefore, on the justifiability of a practice very much opposed to the one which Charpentier recommends. It goes without saying that these are the cases of all where the intra-uterine douche is indicated, but always together with removal of the products of decomposition.

We would emphasize here again Lusk's words, that the necessity for such intervention will not exist where the labor has been properly conducted.—Ed.]

3. *Purulent Infection.*—Here the chances of recovery are less still. The patient is more profoundly affected and will almost infallibly die. The local state is nothing compared to the general. Here often the cause of infection cannot be determined. The patient is assailed by a true purulent diathesis, and all we can do is to fight the different manifestations as they appear. Alcohol and sulphate of quinine are to be given in high dose, since they seem to be more advantageous than numerous

other remedies which have been recommended, such as aconite, salycilic acid, salycilate of soda. The muscular abscesses are to be opened as they form; the articular abscesses are to be treated by blisters.

[This form, the pyæmic, we have twice seen in the practice of others follow close upon the preceding. In both instances a portion of the placenta had been left for Nature to eliminate. She failed, and when the physician was allowed to attempt removal, the putrid infection had passed into the purulent. The issue in each case was fatal.—Ed.]

4. *True Septicæmia.*—Here the entire system is in the grasp of sepsis, and alternately one and another organ is affected, without the lesion being at all tangible. This is the gravest of all forms. We have seen recovery in only one case, and then contrary to all our expectations. We cannot lay down any absolute rules for treatment. We have used phenic acid internally, but without success. The disease, in short, absolutely disarms the physician. He is utterly powerless, so rapid in its progress, so intense and variable its manifestations.

[It is in place to give here briefly the treatment of use in so-called puerperal diphtheria, of which, as we have stated, Garrigues would make a special puerperal affection. He recommends repeated cauterization of the patches with a one to one solution of zinc chloride. Lusk and others prefer the sub-sulphate of iron and iodine, equal parts, as being just as effective and not so likely to cause cicatrization.—Ed.]

5. *Phlegmasia alba dolens.*—This is a benign affection in the great majority of instances, and its tendency is towards spontaneous cure. The treatment is simple: Elevate the limb extended on a splint, immobilize it, cover it with poultices, or belladonna or mercurial ointment, and keep the patient quiet as long as possible. Where the temperature is high we give quinine. The patient should never be allowed to rise until the fever, pain, and œdema, have disappeared. We must never forget that phlegmasia predisposes to embolism, and that this is the most common cause of sudden death during the puerperal state. The women then must assume the erect position by slow degrees, and they must walk only when all morbid phenomena have vanished. For months afterwards the patient should wear an elastic stocking.

Where the phlegmasia proceeds to abscess, this should be opened extensively on strict antiseptic surgical principles.

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